INSIGHT II scanners

TYPE 95DSS3
Integrated Flame Scanner

FUNCTIONAL SAFETY LISTED SIL3

DESCRIPTION

The Fireye 95DSS3 InSight II is a family of versatile fully microprocessor based, integrated flame scanners. The 95DSS3 holds multiple worldwide safety agency approvals (see Model Listings for full details).

The InSight II scanners utilize advanced techniques for discrimination and integrate the flame detection, amplification, safety determination and flame switch functions into a single detection head. No separate amplifier or flame switch module is therefore required to interface with the main burner management system.

InSight II incorporates the superior detection and discrimination elements of the popular InSight product with additional enhanced capability, features and benefits.

The scanner measures the amplitude of the modulations (the flame “flicker”) that occur within the targeted flame. During the scanner set-up procedure, the modulation frequency that yields the best flame ON/OFF discrimination is selected. The appropriate modulation frequency and sensor gain can be either manually or automatically selected.

InSight II is a dual cell scanner utilizing UV and IR detector and various levels of housing type including FM Class I Div 2 and ATEX ExdIIC (see Model Listing for full description of options).

Standard features include two independently adjustable Flame Relays that can be selected to operate from the UV sensor, the IR sensor, or both sensors, 21 choices of modulation frequency, adjustable sensor gain, adjustable flame relay ON/OFF thresholds, two 4-20 mA analog signal strength outputs (one for FR1 and one for FR2), Fault Relay, four selectable programmable files (e.g. for different fuels or firing rates), and Auto Config capability with manual override. Remote communication capability is available via optional “Fireye Explorer” PC software (CU-109).

Ordered separately, a blank cover, or two different operator interfaces are available for the standard (non-CEX) InSight II scanners enabling the user to view and change the operating parameters and setpoints.

Model 95DISP-1 and 95DISP-1-SS are two-line by sixteen-character alpha-numeric VFD Displays with five-pushbutton keypads. The 95DISP-1 is installed by the user onto the end of the scanners. The 95DISP-1-SS is factory installed into the 95DSS3-1CEXSS and 95DSS3-1CEX-2 scanners.

Model 95WIDISP-2 is an Infrared Transmitter, installed by the user onto the end of the scanner instead of a display. The 95WIDISP-2 transmitter provides wireless communications to a model 95WIHH-2 hand-held remote communications tool.

Model 61-7347-1 is a Blank Cover installed by the user onto the end of the scanner to maintain environmental ratings when neither the 95DISP-1 nor 95WIDISP-2 is installed. With the 61-7347-1 installed, the operator interface must either be via "Fireye Explorer" pc software, or by temporarily installing a 95DISP-1 or 95WIDISP-2.

Model 95DSS3-1CEX includes the 95DISP-1 Display. Models 95DSS3-1CEXSS and 95DSS3-1CEX-2 include the 95DISP-1-SS Display. Model 95DSS3-1WICEX includes the 95WIDISP-2 Infrared Transmitter. Model 95DSS3-1CEX-ND includes the 61-7347-1 Blank Cover.

See bulletin CU-116 for 95DISP-1, 95DISP-1-SS, 95WIDISP-2, and 61-7347-1 installation details.

All scanner models are powered by 24 VDC, and contain electronic self-checking (no mechanical shutter required). Electrical connection is via quick-disconnects. Fiber optics are also available for extended viewing applications.

Type 95DSS3-1 is the standard model and is provided with two cable quick-disconnects, one 8-pin and one 12-pin, for use with the 59-546-xx and 59-547-xx prefabricated cable assemblies, ordered separately.

Type 95DSS3-1WOC is similar to the model 95DSS3-1, but without the two cable quick-disconnects. Instead of quick-disconnects, the 95DSS3-1WOC has two threaded openings, one ½" NPT, and one ¾" NPT, for the customer to install their own cable connectors or cable glands. Filler plugs are installed at the factory. The customer will connect their cable(s) to two internal terminal blocks located inside the scanner. *Note: In order to maintain the NEMA 4X / IP66 rating, suitable NEMA 4X / IP66 connectors, fittings, or conduit must be used.*

Type 95DSS3-1WINC is similar to the model 95DSS3-1, but is intended to retrofit into existing InSight I installations where the customer is using one 59-497-xxx cable assembly. Instead of the two cable quick-disconnects, the 95DSS3-WINC has one 12-pin InSight I style quick-disconnect, for use with a 59-497-xxx prefabricated cable assembly. With the 95DSS3-WINC, only the first flame relay (FR1) and its 4-20 ma output are accessible. The user does not have access to the second flame relay (FR2) or to its 4-20 ma output. For backward compatibility with InSight I wiring, the Fault Relay contacts are factory wired in series with the Flame Relay contacts.

Safety Information

WARNING

The equipment described in this manual is capable of causing property damage, severe injury, or death. It is the responsibility of the owner or operator to ensure that the equipment described is installed, operated and commissioned in compliance with the requirements of all national and local legislation, which may prevail.

When this equipment is fitted to an appliance, due regard must also be given to the requirements of that appliance.

Before attempting to install, commission or operate this equipment, all relevant sections of this document must be read and fully understood. If in doubt about any requirements consult Fireye.

Installation, commissioning or adjustment of this product **MUST** be carried out by suitably trained engineers or personnel quilified by training and experience.

After installation or modifications to the installation all functions of the equipment **MUST** be checked to ensure safe and reliable operation of the InSight II scanner.

The manufacturer of this equipment accepts no liability for any consequences resulting from inappropriate, negligent or incorrect installation, commissioning or adjustment of operating parameters of the equipment. There are no user servicable parts.

Before attempting any work on this equipment or any equipment controlled by or connected to this equipment, all related electrical supplies **must** be isolated.

Safety interlocks **must not** be removed or overridden. Any faults once detected **must** be corrected before the control is operated.

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OPERATION

The InSight II has numerous adjustment options available. It can be tuned either automatically or manually to achieve the optimum level of sensitivity to the target flame balanced with superior discrimination of background radiation.

The InSight II scanner measures the amplitude of the modulations (the flame "flicker") that occur within the targeted flame. The two sensors within the scanner measure these amplitudes seen within the ultraviolet (UV) and infrared (IR) spectral ranges across a wide range of flicker frequency bands. In addition the scanner has two independent flame relays (FR1 and FR2) that can be tied to the sensors in logical configurations. It is possible to set up each flame relay to operate from the UV sensor, the IR sensor, or both UV and IR sensors.

During the scanner set up procedure, the logical operation for the two flame relays is selected for the desired sensors. In addition the operation and settings relative to user gain, required (flicker) frequency band and switching thresholds for the relays are selected (refer to commissioning procedure for more details on set up procedures)

The current Flame Signal Strength (FS) of the selected sensors can be viewed on the scanner display via the main menu. This displayed value is the measure of amplitude within the selected modulation (flicker) frequency band, for example:

FS 1: 850 2: 999 (Flame signal for selected sensors 0 to 999)
1: IR&UV 2: UV (Relay Logic operation = FR1 tied to IR & UV; FR2 tied to UV Only)

The scanner set-up procedure, the operation and settings relative to the sensor signals and each of the two flame relays are chosen either in Auto Config or Manual Config mode to provide the optimum flame ON/OFF discrimination.

The flame relays (FR1 and FR2) energize (and their normally open contacts close) when the flame quality is at or above the programmed flame ON threshold for each relay and remain on until the flame quality is at or below the programmed flame OFF threshold. Each relay operates with totally independent settings meaning that the signal strength used can be at different gains and different frequency bands. Each relay can also have independent timings and thresholds associated with it.

IMPORTANT NOTE *- The FAULT RELAY is energized when the scanner is powered (24 vdc) and when the scanner had successfully passed all internal self-checking routines. The Fault relay is de-energized if there is a power interruption to the scanner or if the scanner has detected an internal fault.*

Warning - Fireye recommends that the FAULT RELAY contacts MUST be wired in series with the Flame relay contacts for maximum safety applications.

APPLICATION

The InSight II is best suited to multi-fuel applications that require the highest level of sophistication and flexibility (addition choices of modulation frequencies, and the time-saving Auto Config function), and remote modbus communications capability (e.g. larger multi-burner boilers and furnaces).

The InSight II scanner contains both the infrared and ultraviolet flame sensors described below.

The infrared flame sensor, responds to infrared radiation from 700 to 1700 nanometers wavelength.

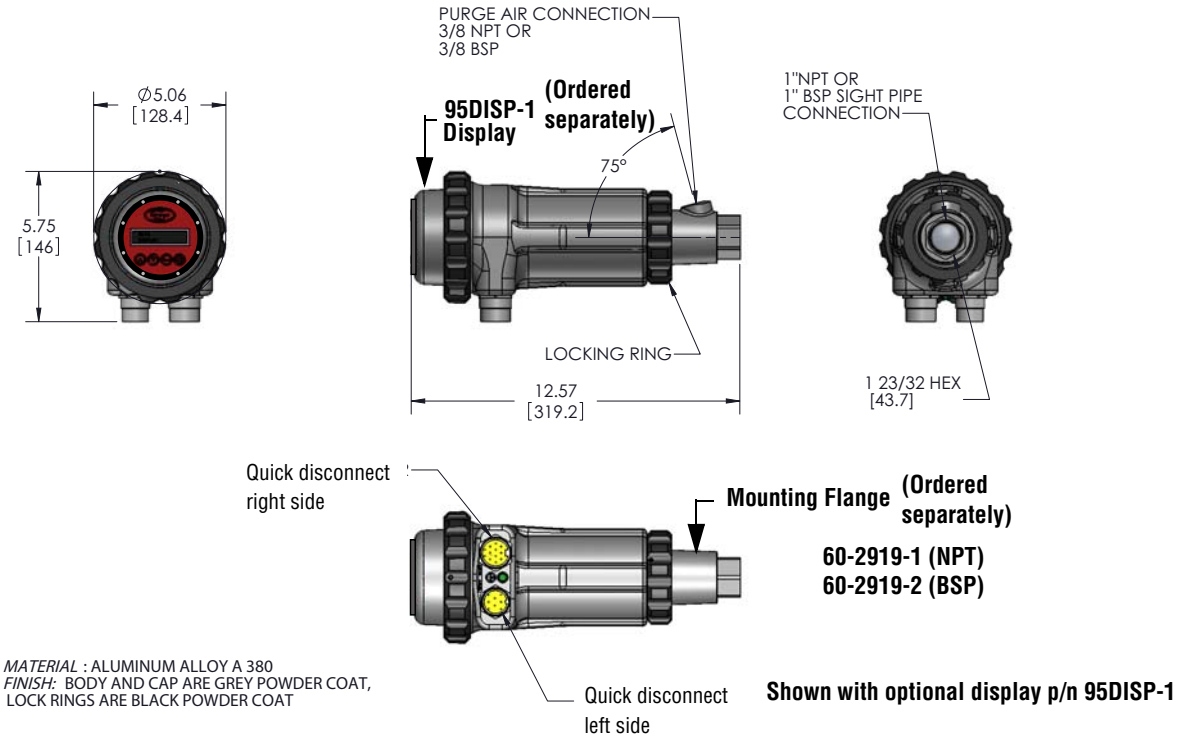
The ultraviolet flame sensor, responds to ultraviolet radiation from 295 to 320 nanometers wavelength.

InSight II SCANNER FEATURES

Features	Basic Models	Flame-Proof Hazardous Area Models			
	95DSS3-1 95DSS3-1WOC 95DSS3-1WINC	95DSS3-1CEX 95DSS3-1CEX-2	95DSS3-1WICEX	95DSS3-1CEX-ND	95DSS3-1CEXSS
Infrared Sensor	1	1	1	1	1
Ultraviolet Sensor	1	1	1	1	1
Flame Relay	2	2	2	2	2
Fault Relay	1	1	1	1	1
4-20 mA Output	YES	YES	YES	YES	YES
Modulation Frequency Selections	21	21	21	21	21
Memory Files	4	4	4	4	4
Communications	YES	YES	YES	YES	YES
Auto Config	YES	YES	YES	YES	YES
Alphanumeric VFD Display	(order separately)	YES	N/A	N/A	YES
Infrared Transmitter	(order separately)	N/A	YES	N/A	N/A
Blank Cover	(order separately)	N/A	N/A	YES	N/A
Housing Material	Aluminum	Aluminum	Aluminum	Aluminum	316 Stainless Steel

DIMENSIONS

FIGURE 1. SCANNER TYPE 95DSS3-1, 95DSS3-1WOC, 95DSS3-1WINC

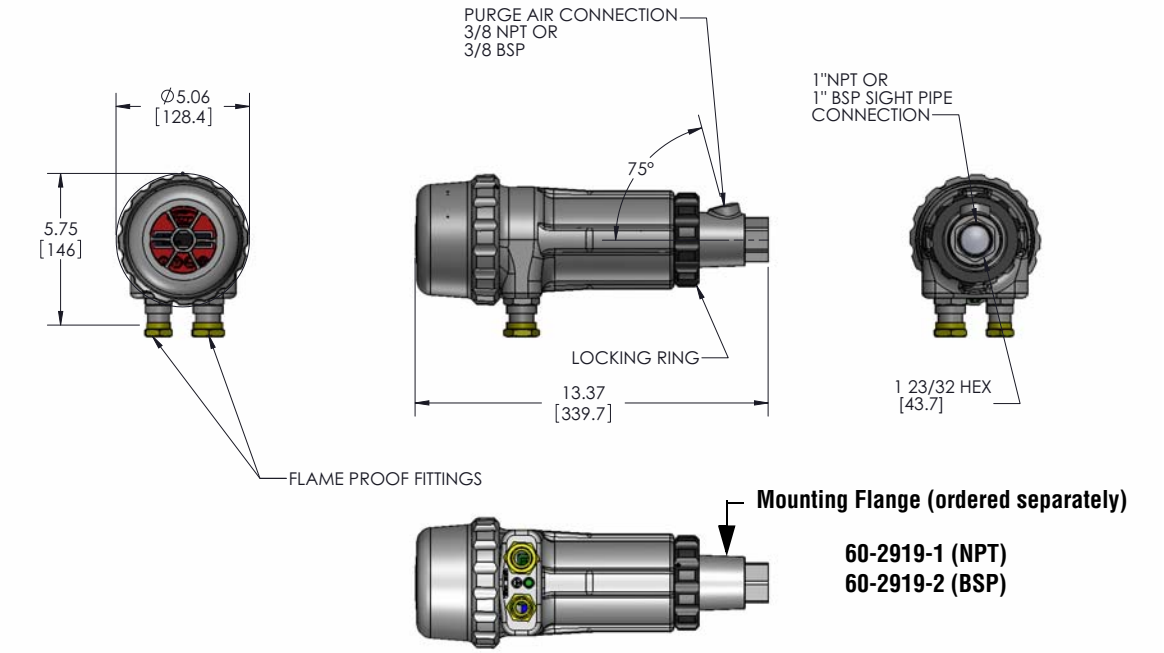


MATERIAL : ALUMINUM ALLOY A 380
FINISH: BODY AND CAP ARE GREY POWDER COAT,
LOCK RINGS ARE BLACK POWDER COAT

Shown with optional display p/n 95DISP-1

Scanner Type	Quick-Disconnect Right Side	Quick-Disconnect Left Side
95DSS3-1	12-pin male (for 59-547-xx cable)	8-pin male (for 59-546-xx cable)
95DSS3-1WOC	none (3/4" NPT filler plug)	none (1/2" NPT filler plug)
95DSS3-1WINC	12-pin male (for 59-497-xxx cable)	none (1/2" NPT filler plug)

FIGURE 2. TYPE 95DSS3-1CEX, -1WICEX, -1CEX-ND SCANNERS, STANDARD FLAME-PROOF HAZARDOUS AREA HOUSING

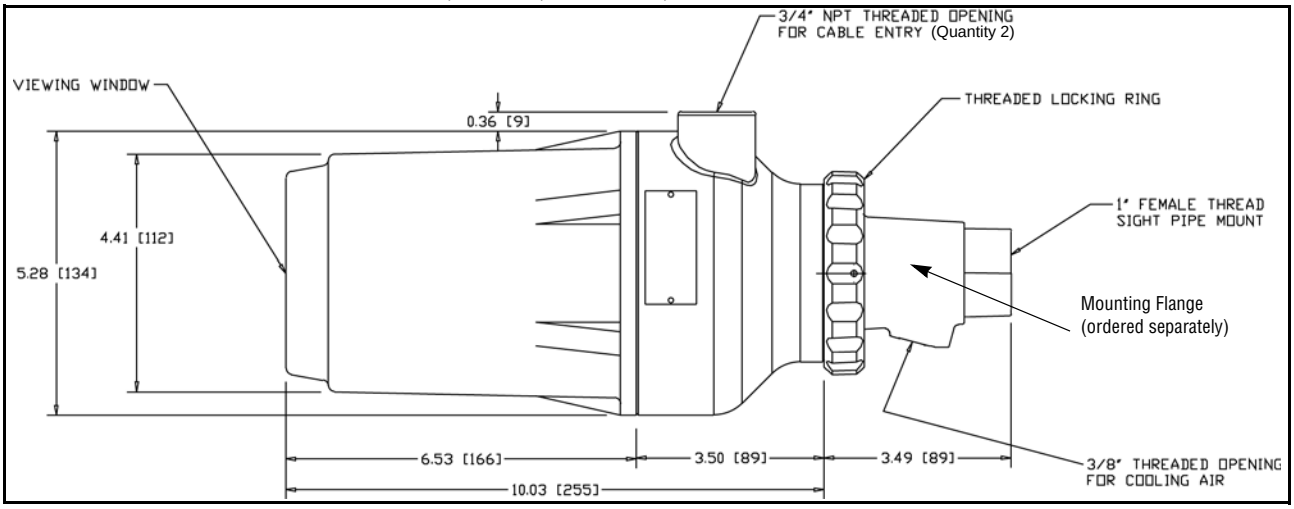


- Window joints are cemented using Aremco bond 568 high temperature epoxy with a Temperature Rating of -65°C to +204°C.
- Window material is fused silica with a temperature rating of +950°C.
- O-rings are made of BUNA-N with a temperature rating of +121°C.
- Suitably rated blanking elements must be used on all unused openings.
- Supply connection wiring shall have a temperature rating of at least +105°C

Note: *The above items are suitable for the InSight II scanners rated environment and conditions of use.*

Warning! - Risk of electrostatic discharge. Make sure that all personnel and equipment are correctly grounded when installing, or handling the InSight II scanner in potentially explosive atmospheres.

FIGURE 3. TYPE 95DSS3-1CEXSS, -1CEX-2, SCANNERS, OPTIONAL FLAME-PROOF HAZARDOUS AREA HOUSINGS



Scanner P/N	Material	Mounting Flange P/N
95DSS3-1CEXSS	Stainless Steel	60-2692SS (NPT) 60-2693SS (BSP)
95DSS3-1CEX-2	Aluminum	60-2692-4 (NPT) 60-2693-4 (BSP)

Note: *Model 95DSS3-1CEX includes the 95DISP-1 Display.*
Models 95DSS3-1CEXSS and 95DSS3-1CEX-2 include the 95DISP-1-SS Display.
Model 95DSS3-1WICEX includes the Infrared Transmitter.
Model 95DSS3-1CEX-ND includes the 61-7347-1 blank cover

Warning! - Risk of electrostatic discharge. Make sure that all personnel and equipment are correctly grounded when installing, or handling the InSight II scanner in potentially explosive atmospheres.

MODEL LISTING

PART NUMBER (see note 6)	SENSOR	Alpha Numeric VFD Display	Infrared Trans-mitter	12-PIN CONNECTOR	8-PIN CONNECTOR	HOUSING RATING (see note 1)	AGENCY APPROVALS							
							UL C/US	FM	DIN-DVGW	DIN-CERTCO	CE	AGA	ABS	In Metro
95DSS3-1	IR & UV	(order sepa-rately)	(order sepa-rately)	YES	YES	NEMA 4X, IP66 CLASS I DIV. 2 GROUPS A, B, C & D CLASS II DIV. 2 GROUPS F & G (see note 2)	YES	YES	YES	YES	YES	YES	YES	YES
95DSS3-1WOC **(see note 5)**				NO	NO	⟨Ex⟩ II 3 G Ex nA nC IIC T4 IP66 II 3 D Ex tD A22 IP66 T135 °C Ta= -40°C to -65°C (see notes 2,3)						NO	NO	NO
95DSS3-1WINC				YES	NO							NO	NO	NO
95DSS3-1CEX (includes 95DISP-1)	IR & UV	YES	NO	NO	NO	NEMA 4X, IP66 ⟨Ex⟩ II 2 G Ex d IIC T6 IP66 II 2 D Ex tb IIIC T85°C Ta=-40°C to +65°C (see note 4)	YES	YES	YES	YES	YES	YES	YES	YES
95DSS3-1WICEX (includes 95WIDISP-2)	IR & UV	NO	YES											
95DSS3-1CEX-ND (includes 61-7347-1)	IR & UV	NO	NO											
95DSS3-1CEXSS (includes 95DISP-1-SS) **(see note 5)**	IR & UV	YES	NO	NO	NO	⟨Ex⟩ II 2 G D Ex d IIC T6 IP66 Ta=-40°C to +65°C (certified by CESI)	YES	NO	YES	YES	YES	NO	NO	NO
95DSS3-1CEX-2 (includes 95DISP-1-SS) **(see note 5)**	IR & UV	YES	NO	NO	NO	⟨Ex⟩ II 2 G D Ex d IIC T6 IP66 Ta=-40°C to +60°C (certified by CESI)	NO	NO	NO	NO	NO	NO	NO	NO

95DISP-1 (display)		YES	NO				YES	YES	YES	YES	YES	YES	YES	YES
95WIDISP-2 (IR transmitter for wireless dis-play) *		NO	YES											
61-7347-1 (blank cover)		NO	NO				NO	NO	NO	NO	NO	NO	NO	NO

Notes:

1. Hazardous area ratings (Class I, Class II and ATEX) certified by FM unless otherwise noted.
2. Hazardous area requirements for InSight II scanners with electrical connectors:The plastic "Loc Fast" retainers provided with the 59-546-xxx and 59-547-xx cables must be installed over the quick disconnect connectors.
3. ATEX Certification number FM09ATEX0051X, IECEx cert# IECEx FMG 09.0008X
4. ATEX Certification number FM09ATEX0026X, IECEx cert# IECEx FMG 08.0008X
5. In order to maintain the NEMA 4X / IP66 rating, suitable NEMA 4X / IP66 connectors, fittings, or conduit must be used.

6. UL Functional Safety Listed Primary Safety Control 5AC0 EN/IEC 61508, Parts 1-7 (2010) up to SIL3. ANSI/ UL 1998 (2008) Class 2

** For use with wireless handheld commissioning tool, p/n 95WIHH-2, see bulletin 133-735*

SPECIFICATIONS

MECHANICAL:

Housing Material: Standard Models and Model CEX-2: Cast aluminum with gray polyester powder coat finish
Model CEXSS: 316 stainless steel w/zinc primer, gray epoxy midcoat, polyurethane topcoat

Housing Weight: Standard Models: 5.9 lbs. (2.69kg); CEX-2 Model: 13.2 lbs (5.98 kg)
Model CEXSS: 21.3 lbs. (9.66 kg); All other CEX Models: 7.1 lbs (3.22 kg

Environmental: NEMA 4X, IP66, Class I Division 2, Groups A, B, C & D, Class II Division 2, Groups F& G (refer to agency approvals table)

Mounting: Requires one threaded mounting flange, ordered separately (see below). For fiber optic mount, refer to bulletin CU-117

Cooling / Purge Air Requirements:

Source: Clean, dry, cool

Volume: 4 SCFM (113 l/min) at 3/8" threaded mounting flange, or 1 inch "Y" fitting, mounted on scanner sight pipe. Temperature near the upper limit of the scanner operating range and/or use with dirty/dusty fuels may require up to 15 SCFM (425 l/min).

Pressure: Adequate to overcome furnace or windbox pressure

Operating Temperature Rating: -40°F to + 150°F (-40°C to +65°C)

Storage Temperature Rating: -40°F to + 185°F (-40°C to +85°C)

Humidity: 0% to 95% relative humidity, non-condensing

STANDARD MOUNTING FLANGE:

Material/Weight: Cast aluminum with gray polyester powder coat finish. Contains an integral heat-insulating female thread insert / 0.62 lbs (0.28 kg)

Flange Threads: P/N 60-2919-1 1" NPT female pipe mount with 3/8" NPT female cooling air connection.
P/N 60-2919-2 1" BSP female pipe mount with 3/8" BSP female cooling air connection.

OPTIONAL MOUNTING FLANGE, STAINLESS STEEL:

Material/Weight: 316 Stainless steel (without heat-insulating threaded insert), with zinc primer, gray epoxy midcoat, polyurethane topcoat / 1.86 lbs. (0.84 kg).

Flange Threads: P/N 60-2692SS 1" NPT female pipe mount with 3/8" NPT female cooling air connection.
P/N 60-2693SS 1" BSP female pipe mount with 3/8" BSP female cooling air connection.

OPTIONAL MOUNTING FLANGE, CAST ALUMINUM:

Material/Weight: Cast aluminum (without heat-insulating thread insert), with grey polyester powder coat finish / 0.5 lbs (0.23 kg)

Flange Threads: P/N 60-2692-4, 1" NPT female pipe mount with 3/8" NPT female cooling air connection.
P/N 60-2693-4, 1" BSP female pipe mount with 3/8" BSP female cooling air connection.

ELECTRICAL:

Input Power: 24 Vdc, +10%, -15% supply current: 0.35 A, 8.5 VA, Hold Time must be 20 msec Min. Fireye power supply 60-2685 is recommended

Electrical Connection: 8-pin and 12-pin screw type quick-disconnect, (model 95DSS3-1)

Relay Output: 2 FLAME RELAYS, SPDT (N.O. and N.C.)
FAULT RELAY, SPST (N.O.)

Contact Rating: Minimum: 10 mA @ 5 Vdc
Maximum: 100 mA @ 30 Vdc; 100 mA @ 50 Vac

Analog Output: Two, 4-20 mA dc current, referenced to 24Vdc common, Max. connected 1oad: 750 ohms

Operator Interface: P/N 95DISP-1, 95DISP-1-SS, Alpha -Numeric Display with five pushbutton keys.
P/N 95WIDISP-2 Infrared Transmitter, used in conjunction with
P/N 95WIHH-2 Hand-held communications tool.

Cable Specification: P/N 59-546 (8-conductor), P/N 59-547 (12-conductor):

Multi-core, 8 and 12 conductor (color coded), 18- AWG, with foil wrap and overall braided shield and drain wire. PLTC-ER rating. Maximum cable length 1000 feet (305 meters)

Cable Jacket: PVC / black (flame-retardant, RoHS compliant)

Temperature Rating: -40°F to +221°F (-40°C to +105°C)

P/N 59-546 Nominal O.D. 0.44" (11.2 mm), maximum O.D. 0.48” (12.2mm)

P/N 59-547 Nominal O.D. 0.52" (13.2 mm), maximum O.D. 0.56” (14.2mm)

INSTALLATION NOTES

The InSight II flame scanners determine the presence or absence of flame by monitoring the frequency spectrum of the flame. The scanner should initially be mounted so that the primary combustion zone is within the scanner’s line of sight.

The location and sighting instructions listed in the following sections are rough guidelines for the location of the scanner. The scanner provides feedback via its VFD or wireless display to assist in the adjustment and proper alignment of the flame scanner. Refer to the setpoint procedures described in this bulletin.

Note: *An acceptable scanner location must ensure the following:*

Reliable main flame and/or ignitor flame detection at all air flow and furnace loads (ranges of fuel firing).

Rejection of the ignitor flame if too short, or in the wrong position to ignite the main flame reliably, thus prohibiting the delivery of fuel to the burner.

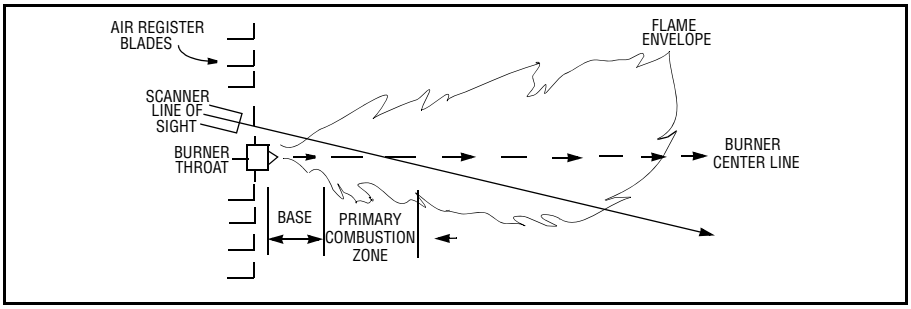
INSTALLATION PROCEDURE

WARNING: Protective filtered lenses should be worn when viewing flame. Infrared and ultraviolet energy from the flame can be damaging to the eyes.

1. The best results are obtained when the scanner is aimed so that the scanner’s line of sight intersects the burner center at a slight angle (e.g. 5 degrees) and sees a maximum of the primary combustion zone, as shown in Figure 4. If only one scanner is used per burner, the line of sight should also intersect the igniting flame.
2. For installations where separate scanners are used to monitor main and ignitor flames, the main flame scanner should be sighted so it does not detect the ignitor flame.
3. The scanner should have an unrestricted view of flame as far as possible. Physical obstructions such as air register blades, interfering vanes, or other hardware should be cut away or notched so they do not fall within the scanner’s line of sight as shown in Figure 6.

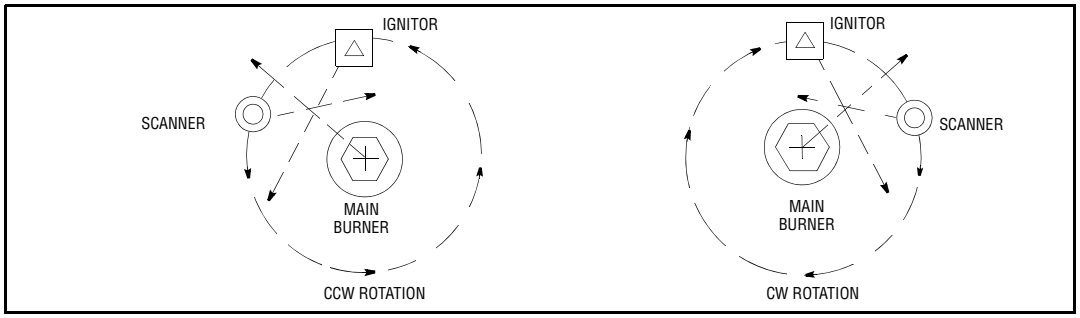
Note: *Always check with the burner manufacturer* ***before*** *you trim the register blades.*

FIGURE 4. SINGLE BURNER SCANNER SIGHTING



4. Consideration must be given to burner secondary air rotation, some burners have clockwise (CW) air rotation and others have counterclockwise (CCW) air rotation. If combustion air enters the furnace with a rotational movement of sufficient velocity to deflect the ignitor flame in the direction of rotation, position the scanner 10 to 30 degrees downstream of the ignitor as shown in Figure 5 and close to the periphery of the burner throat (See Figure 4).

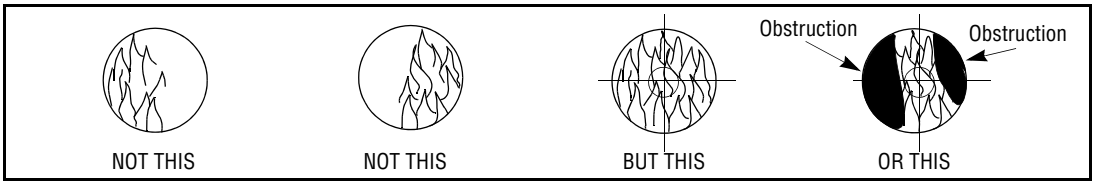
FIGURE 5. SCANNER LOCATION VS. SECONDARY AIR ROTATION



5. Having determined the approximate location for the sight pipe, cut a clearance hole for a 2 inch pipe through the burner plate. Look through the hole. If register vanes interfere with the desired line of sight, the interfering vane(s) should be trimmed to assure an unrestricted viewing path at all firing levels as indicated in Figure 6.

***Note:** Always check with the burner manufacturer **before** you trim register vanes.*

FIGURE 6. IF POSSIBLE, FLAME SHOULD COMPLETELY COVER SIGHT OPENING



6. The preferred method for mounting surface mounted scanners requires the use of a swivel mount, P/N 60-1664-3 (NPT), shown in Figures 7, 8, and 9. Center the swivel mount over the two inch hole in the burner plate and secure using three hexed cap screws (not provided). Install the sight pipe on the swivel mount. If a swivel is not used, insert the end of the sight pipe into the hole, align the hole to the desired viewing angle and tack weld (welding must be adequate to temporarily support the weight of the installed scanner). The sight pipe should be arranged to slant downward so that dirt and dust will not collect inside.

CAUTION: Use no more than one foot of one inch diameter sight pipe. Increase the sight pipe diameter one inch for every additional foot of sight pipe length used to avoid restricting the scanner's field of view.

When a satisfactory sighting has been confirmed by operational testing, secure the swivel mount's ball position in place by tightening the three hex head cap screws located on the swivel mount ring.

7. In larger multi-burner type applications such as power, kiln or refinery burners, it is recognized that there may be several obstructions within the scanner overall range of view. The same principle of adjusting the scanner such that the flame is within the center of its field of view applies. Use of a swivel mount allows the scanner to be adjusted to target the flame within the center of the scanner range of view. (see obstructed view in figure 6 above)
8. For ease of use, the scanner should be installed on the sight pipe so the VFD display (if used) can easily be read.

Note: *Operation of the VFD display is independent of position.*

9. The scanner lens must be kept free of contaminants (oil, ash, soot, dirt) and the scanner housing temperature must not exceed its maximum rating of 150°F (65°C). Excessive temperatures will shorten scanner life. Both requirements will be satisfied by a continuous injection of purge air at either the 3/8" housing inlet or the 1" "Y" connection ahead of the swivel mount as shown in Figures 7, 8 and 9.

Note: *Internal scanner temperature is available via the VFD display. See "Status Menu" under "Programming the Scanner."*

The scanner mounting may be made with provision for purge air through only the 3/8" opening as shown in Figure 9 or for purge air through either the 3/8" opening or the 1" "Y" connection as shown in Figure 8. In the latter arrangements, normally only one of the two connections is provided with purge air and the other connection is plugged. When a sealing coupling is used as shown in Figure 7, the 1" "Y" connection is used for the purge air and the 3/8" opening is plugged.

It is good practice to use the sealing coupling (P/N 60-1199 with NPT threads) on all installations to insure against unwanted furnace pressures from damaging the scanner lens.

Under normal conditions, with clean burning fuels and moderate ambient temperature conditions, purge air flow of approximately 4 SCFM (113 l/min) is generally adequate. Up to 15 SCFM (425 l/min) may be required for fuels that produce high levels of ash or soot, or for hot environments to maintain the scanner's internal temperature within specification.

MECHANICAL ACCESSORIES

Surface Mounting Flange (Required)

Standard: **Cast aluminum** with gray polyester powder coat finish. Contains an integral heat-insulating female thread insert (external heat-insulating nipple not required).

P/N 60-2919-1 1" NPT female pipe mount with 3/8" NPT female cooling air connection.

P/N 60-2919-2 1" BSP female pipe mount with 3/8" BSP female cooling air connection.

Optional: **316 Stainless Steel** with zinc primer, gray epoxy midcoat and polyurethane top coat finish. Does not contain heat-insulating insert.

P/N 60-2692SS 1" NPT female pipe mount with 3/8" NPT female cooling air connection.

P/N 60-2693SS 1" BSP female pipe mount with 3/8" BSP female cooling air connection.

Optional: **Cast aluminum** with grey polyester powder coat finish. Does not contain heat-insulating insert.

P/N 60-2692-4, 1" NPT female pipe mount with 3/8" NPT female cooling air connection.

P/N 60-2693-4, 1" BSP female pipe mount with 3/8" BSP female cooling air connection.

Swivel Mount (Optional)

The scanner swivel mount, P/N 60-1664-3 (NPT) (see Figure 9, Item A), is used to adjust the scanner sighting angle after the scanner has been installed, The swivel mount is shown in Figures 7, 8, and 9.

Sealing Coupling with Quartz Window (Optional)

The sealing coupling, P/N 60-1199-x (see Figure 10, Item D), is used whenever a coupling or a seal is required for scanner piping. The quartz window blocks furnace pressure, hot gases and soot from coming in contact with the scanner and contaminating the lens. P/N 60-1199-1 has a 1" NPT thread, p/n 60-1199-2 has a 1" BSP thread. When the sealing coupling is used, a 1 inch "Y" fitting must be used downstream of it for connection of a purge air supply (plug 3/8"opening).

Orifice Kit (Optional)

An orifice may be used to restrict the scanner's field of view aiding discrimination between the target flame and other flames in the combustion chamber. An orifice may also be used to reduce the total amount of radiation reaching the scanner, thereby avoiding the chance of saturation. Orifice kit (P/N 53-121) contains nine different orifice sizes, and two retaining clips. The orifice can be installed either within the 60-1664 swivel mount, within the 60-1199 coupling, or within the 60-2919-1, 60-2919-2 surface mounting flange. Refer to figures 11 and 12.

Cooling Cover/Vortex-Tube Cooler Kit (Optional)

For high ambient temperature applications, a Cooling Cover (p/n 60-2930-x) and Vortex-Tube Cooler Kit (P/N 60-2720) are available. Refer to bulletins 133-749 and CU-103 for details.

FIGURE 7.

	PART NUMBER
A. SWIVEL MOUNT	60-1664-3 (NPT) 60-1664-4 (BSP)
B. 1" WYE	35-200 (NPT)
C. 1" CLOSE NIPPLE	35-201 (NPT)
D. SEALING COUPLING W/QUARTZ WINDOW	60-1199-1 (NPT) 60-1199-2 (BSP)
E. 1" NIPPLE	35-127-2 (NPT)
F. 3/8" PLUG	35-202 (NPT)
G. SURFACE MOUNTING FLANGE	60-2919-1 (1"NPT) 60-2919-2 (1"BSP)

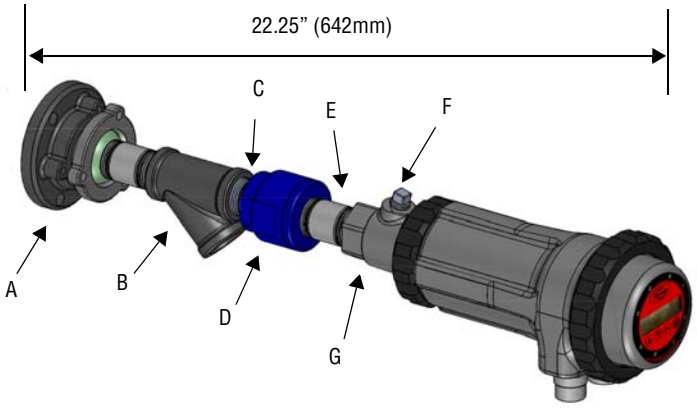


FIGURE 8.

	PART NUMBER
A. SWIVEL MOUNT	60-1664-3 (NPT) 60-1664-4 (BSP)
B. 1" WYE	35-200 (NPT)
C. 1" NIPPLE	35-127-2 (NPT)
D. 3/8" PLUG	35-202 (NPT)
E. SURFACE MOUNTING FLANGE	60-2919-1 (1"NPT) 60-2919-2 (1"BSP)

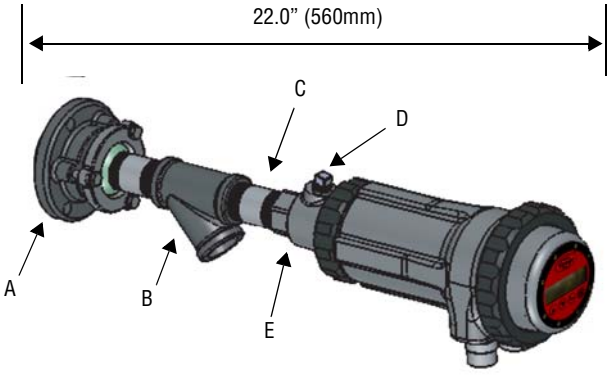


FIGURE 9.

	PART NUMBER
A. SWIVEL MOUNT	60-1664-3 (NPT) 60-1664-4 (BSP)
B. 1" NIPPLE	35-127-2 (NPT)
C. 3/8" THREADED OPENING	
D. SURFACE MOUNTING FLANGE)	60-2919-1 (1"NPT) 60-2919-2 (1"BSP)

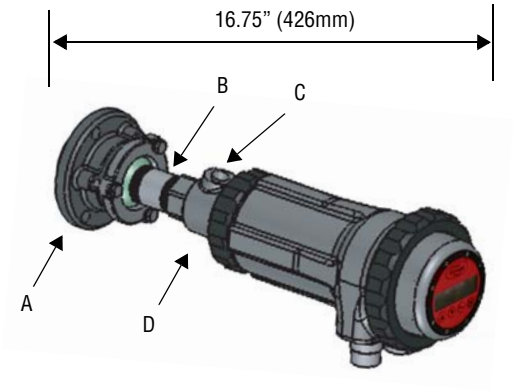
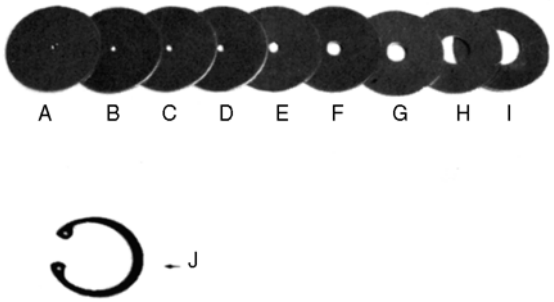


FIGURE 10.

	PART NUMBER
A. SWIVEL MOUNT	60-1664-3 (NPT)
SWIVEL MOUNT	60-1664-4 (BSP)
B. SCANNER CABLE w/connector	59-547-xx
C. SCANNER CABLE w/connector	59-546-xx
D. SEALING COUPLING W/QUARTZ WINDOW	60-1199-1 (NPT)
	60-1199-2 (BSP)

FIGURE 11.

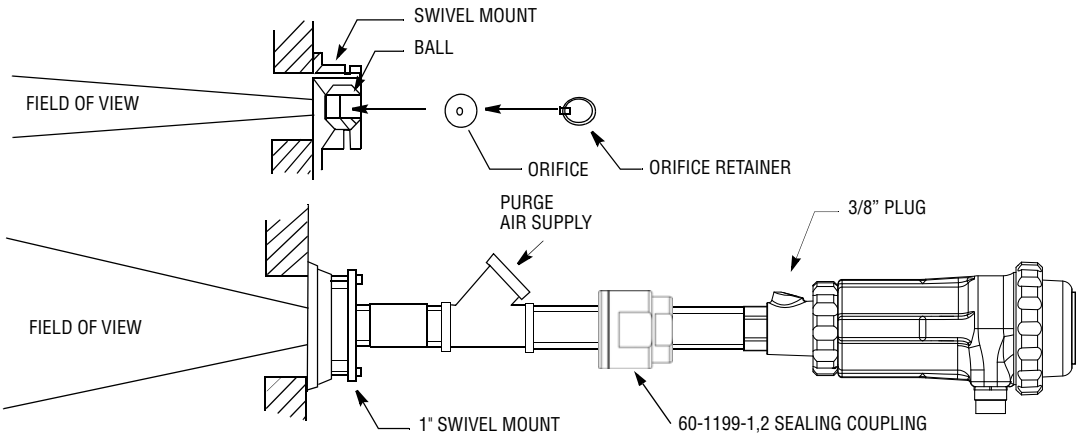
A-I. Orifices: 0.062" - 0.5" DIA
J. Orifice Retainer 34-181



ORIFICES

Figure	Qty.	Part Number	Description
11	1	53-121	Orifice Kit: Contains following items:
11A	1	53-121-2	Orifice: Diameter = 0.062"
11B	1	53-121-3	Orifice: Diameter = 0.078"
11C	1	53-121-4	Orifice: Diameter = 0.093"
11D	1	53-121-5	Orifice: Diameter = 0.109"
11E	1	53-121-6	Orifice: Diameter = 0.125"
11F	1	53-121-7	Orifice: Diameter = 0.187"
11G	1	53-121-8	Orifice: Diameter = 0.250"
11H	1	53-121-9	Orifice: Diameter = 0.375"
11I	1	53-121-10	Orifice: Diameter = 0.500"
11J	2	34-181	Orifice Retainer

FIGURE 12.



ELECTRICAL ACCESSORIES (see note)

Note: Hazardous Area requirements for InSight II scanners with electrical connectors:

1. For hazardous locations, the plastic "Lok Fast" retainer provided with cable 59-546-xx and 59-547-xx must be installed over the quick disconnect connectors.

Scanner Cables, P/N 59-546, 59-547

Fireye recommends P/N 59-546 (8-conductor) and 59-547 (12-conductor) color-coded multi-core cables. This cable includes 18 AWG conductors and a flame-retardant, low smoke, zero halogen PVC jacket. Refer to page 10 for full cable specifications. Refer to figure 13, 14 for color code and connection information. This raw-stock cable is used as extension wiring between a junction box or Wiring Harness Assembly (below) and the burner management system. The maximum total cable length is 1000 feet (305 meters) per scanner.

Note: Model 95DSS3-1WINC requires p/n 59-497 (12-conductor) cable.

24 Volt DC Power Supplies

Fireye offers DIN rail mounted 24 vdc power supplies for use with the InSight II Integrated flame scanner. Model 60-2685-25 can power up to five InSight II scanners, model 60-2685-4 and 60-2685-50 can power up to ten InSight II scanners (see note 1). Refer to bulletins CU-100 and CU-118 for details.

PART NUMBER	DESCRIPTION	NOTES	BULLETINS
60-2685-25	24 VDC Switching Power Supply, 100-240 vac 50/60 Hz. input, 2.5 A output at 24 vdc. Powers up to five scanners. Dimensions: 3.7"(95mm) high x 1.6" (40mm) wide x 4.3"(108mm) deep	1	CU-118
60-2685-50	24 VDC Switching Power Supply, 100-240 vac 50/60 Hz. input, 5.0A output at 24 vdc. Powers up to ten scanners. Dimensions: 4.5" (115mm) high x 2.0" (50mm) wide x 4.8" (121mm) deep.	1	CU-118
60-2539-12	DIN mounting rail, 12" (305mm)long		
60-2539-24	DIN mounting rail, 24" (610mm)long		
60-2539-36	DIN mounting rail, 36" (914mm)long		

Notes:

1. Listed output is when power supply is vertically mounted, and with an ambient temperature of 104F (40C) maximum.

Scanner Cable with Female Connector, P/N 59-546-x, 59-547-x

Fireye offers the 59-546 (8-conductor) and 59-547 (12-conductor) cables in precut lengths with a female factory installed connector. These assemblies are offered in several lengths ranging from 3-meters (9 ft., 10 in.) to 90-meters (295 ft., 3 in.)

Table 1: SCANNER CABLES 59-546-x

PART NUMBER	DESCRIPTION	LENGTH	
		METERS	FEET
59-546-3	8-Conductor 3-meter cable assembly with 8-pin female connector.	3 meters	9 feet, 10 inches
59-546-6	8-Conductor 6-meter cable assembly with 8-pin female connector.	6 meters	19 feet, 8 inches
59-546-9	8-Conductor 9-meter cable assembly with 8-pin female connector.	9 meters	29 feet, 3 inches
59-546-12	8-Conductor 12-meter cable assembly with 8-pin female connector.	12 meters	39 feet, 4 inches
59-546-15	8-Conductor 15-meter cable assembly with 8-pin female connector.	15 meters	49 feet, 2 inches
59-546-30	8-Conductor 30-meter cable assembly with 8-pin female connector.	30 meters	98 feet, 5 inches
59-546-45	8-Conductor 45-meter cable assembly with 8-pin female connector.	45 meters	147 feet, 7 inches
59-546-60	8-Conductor 60-meter cable assembly with 8-pin female connector.	60 meters	196 feet, 10 inches
59-546-90	8-Conductor 90-meter cable assembly with 8-pin female connector.	90 meters	295 feet, 3 inches
59-546	8-Conductor cable **without connector**. Sold by the foot for use as extension cable from a junction box.	-	As required

Table 2: SCANNER CABLES 59-547-x

PART NUMBER	DESCRIPTION	LENGTH	
		METERS	FEET
59-547-3	12-Conductor 3-meter cable assembly with 12-pin female connector.	3 meters	9 feet, 10 inches
59-547-6	12-Conductor 6-meter cable assembly with 12-pin female connector.	6 meters	19 feet, 8 inches
59-547-9	12-Conductor 9-meter cable assembly with 12-pin female connector.	9 meters	29 feet, 3 inches
59-547-12	12-Conductor 12-meter cable assembly with 12-pin female connector.	12 meters	39 feet, 4 inches
59-547-15	12-Conductor 15-meter cable assembly with 12-pin female connector.	15 meters	49 feet, 2 inches
59-547-30	12-Conductor 30-meter cable assembly with 12-pin female connector.	30 meters	98 feet, 5 inches
59-547-45	12-Conductor 45-meter cable assembly with 12-pin female connector.	45 meters	147 feet, 7 inches
59-547-60	12-Conductor 60-meter cable assembly with 12-pin female connector.	60 meters	196 feet, 10 inches
59-547-90	12-Conductor 90-meter cable assembly with 12-pin female connector.	90 meters	295 feet, 3 inches
59-547	12-Conductor cable **without connector**. Sold by the foot for use as extension cable from a junction box.	-	As required

SCANNER DISPLAYS (for standard / non-CEX models)

Scanner Display, P/N 95DISP-1, 95DISP-1-SS

P/N 95DISP-1 is a two-line by sixteen-character alpha-numeric VFD Display with a five-pushbutton keypad. The 95DISP-1 is installed by the user onto the end of the standard scanners enabling the user to view and change the operating parameters and setpoints at the scanner itself. The 95DISP-1-SS is factory installed into the 95DSS3-1CEXSS and 95DSS3-1CEX-2 scanners.

Infrared Transmitter, P/N 95WIDISP-2

P/N 95WIDISP-2 is an Infrared Transmitter, installed by the user onto the end of the scanner instead of a display. The 95WIDISP-2 transmitter provides infrared wireless communications to a model 95WIHH-2 hand-held remote communications tool.

CAUTION - Damage to electronic components through electrostatic discharge (ESD)

Note: Before touching the internals of the InSight II scanner installers can discharge any static built up on their body by touching the outside of the scanner housing if the ground is already attached. If the scanner isn't already grounded, the installer could touch a nearby object that is earthed.

Hand-Held Remote Communications Tool, P/N 95WIHH-2

P/N 95WIHH-2 is hand-held infrared remote communications tool. It contains an alpha-numeric display and pushbutton keys enabling the user to view and change the operating parameters and setpoints of an InSight II scanner when standing in line-of-sight of the scanner. The InSight II scanner must be fitted with the optional 95WIDISP-2 infrared Transmitter.

Blank Cover, P/N 61-7347-1

P/N 61-7347-1 is a Blank Cover used to maintain environmental ratings when neither the 95DISP-1 nor 95WIDISP-2 is installed. With the 61-7347-1 installed, the operator interface must either be via "Fireye Explorer" pc software, or by temporarily installing a 95DISP-1 or 95WIDISP-2.

Refer to bulletin CU-116 for 95DISP-1, 95DISP-1-SS, 95WIDISP-2, and 61-7347-1 installation instructions.

Note: Model 95DSS3-1CEX includes the 95DISP-1 Display.
Models 95DSS3-1CEXSS and 95DSS3-1CEX-2 include the 95DISP-1-SS Display.
Model 95DSS3-1WICEX includes the 95WIDISP-2 Infrared Transmitter.
Model 95DSS3-1CEX-ND includes the 61-7347-1 Blank Cover.

SCANNER WIRING

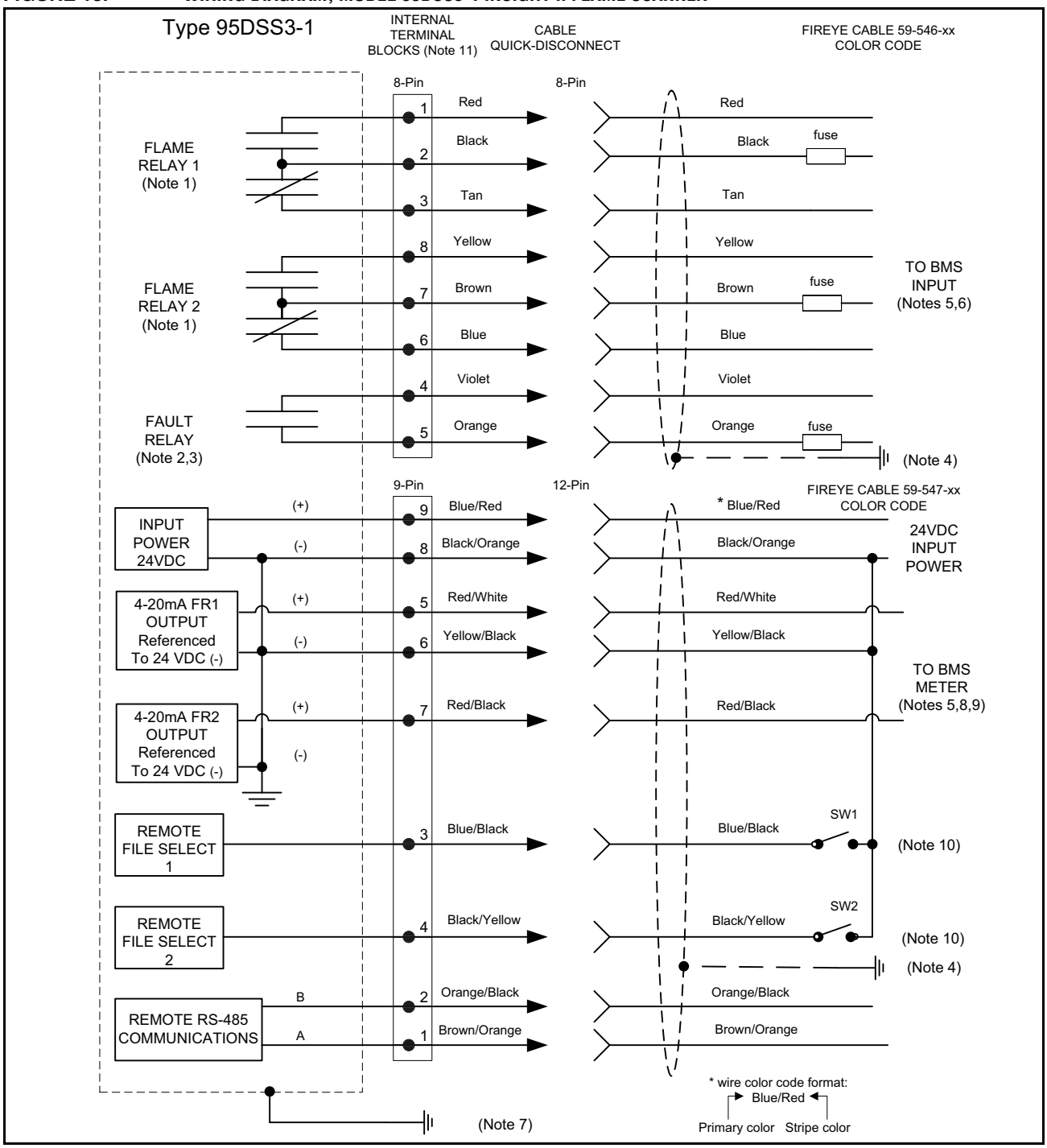
To reduce electrical noise interference, take precautions to keep the scanner cable away from any high inductive wiring associated with high inductive loads or high voltage, high energy spark ignition systems.

CAUTION: The flame scanner requires 24 Vdc power for operation. Connection to a 24 Vac or 120 Vac power source will damage the scanner. Refer to wiring diagrams.

External 0.5 Amp slow-blow fuses are recommended to protect Flame Relay and Fault Relay contacts

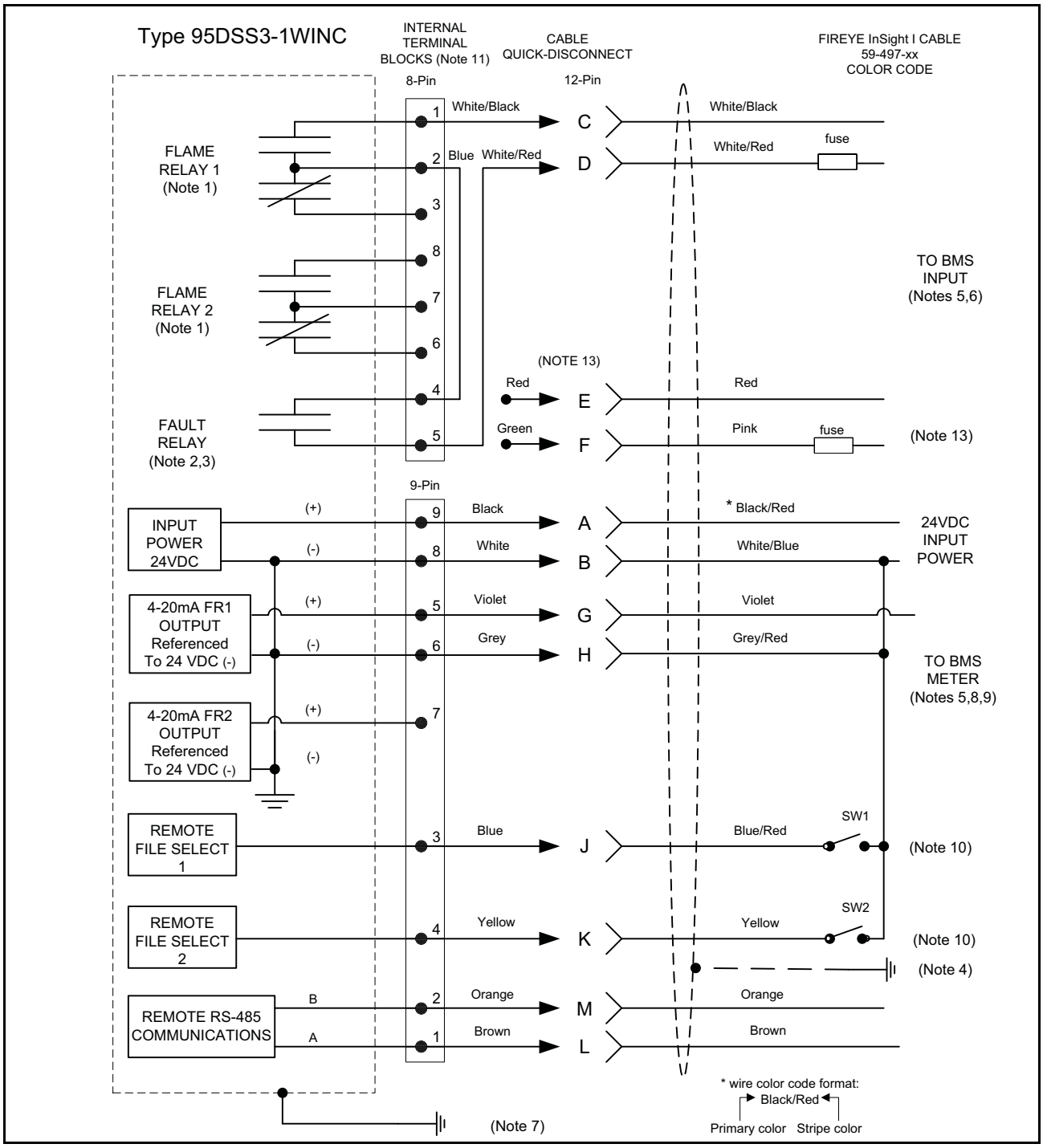
All wiring to the scanner should be rated at 105°C. For runs less than 1000 feet, the use of Fireye Scanner Cable, P/N 59-546, (8 wire) and P/N 59-547, (12 wire) is recommended. For runs in excess of 1000 feet, consult the factory.

FIGURE 13. WIRING DIAGRAM, MODEL 95DSS3-1 INSIGHT II FLAME SCANNER



Notes: *(see page 21)*

FIGURE 14. RETROFIT WIRING DIAGRAM, MODEL 95DSS3-1WINC INSIGHT II SCANNER USING INSIGHT I CABLE



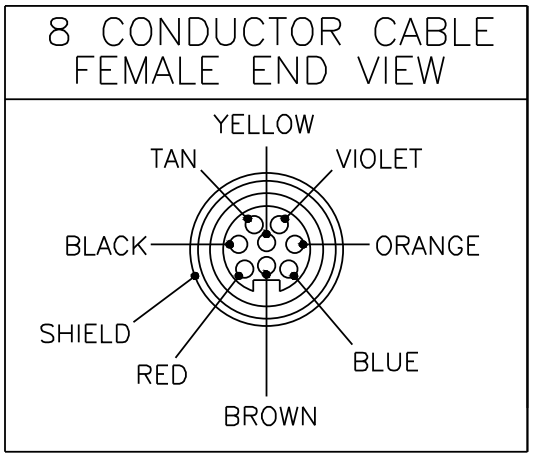
Notes: (see page 21)

Notes:

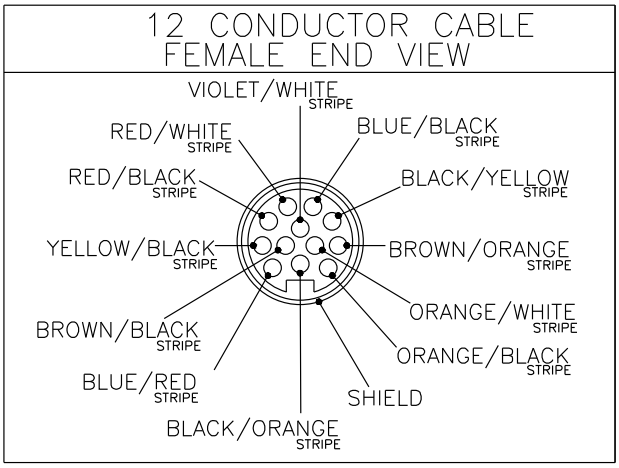
1. Flame relay contacts are shown in de-energized (no flame).
2. Fault relay contacts are shown in de-energized (fault condition).
3. Fireye recommends that the FAULT RELAY contacts MUST be wired in series with the Flame relay contacts for maximum safety applications.
4. Connect cable shield to earth ground at power source.
5. BMS = Burner Management System (by others).
6. External 0.5 Amp slow-blow fuses recommended.
7. A ground screw is provided on the scanner body. An external ground wire may be required by local codes.
8. The scanner's 4-20 ma output is internally powered and must be connected to a passive (voltage-free) device. Do not connect to an externally powered 4-20 ma loop or the scanner may be damaged.
9. The return (-) for the customer's 4-20 ma device may be connected to either scanner pin 6 or pin 8.
10. With Remote File Select programmed as “LINE”, external switches SW1/SW2 (not furnished) switch between internal memory files when connected to 24Vdc (-) supply.
11. The numbers shown refer to the scanner’s internal 8-pin and 9-pin terminal blocks. The 59-546 and 59-547 quick-disconnect pins are not numbered. The 95DSS3-WINC quick-disconnect pins are lettered
12. The following peripherals must be SELV/PELV by an approval according to DIN EN 60950 or an external isolator must be used to provide an SELV system:
- 24V power supply
- RS485
- 4-20mA wiring
- Remote file select monitoring
- Relay contacts

13. Cable quick-disconnect pins E and F (Red and Green wires) are not connected to the 95DSS3-1WINC's internal terminal blocks. Because the Fault Relay contacts are internally wired in series with the Flame Relay contacts, the Fault Relay contacts are not available for independent monitoring in the model 95DSS3-1WINC.

FIGURE 15. INSIGHT II CABLE CONNECTOR, Female Pin Orientation



59-546-xx cable connector



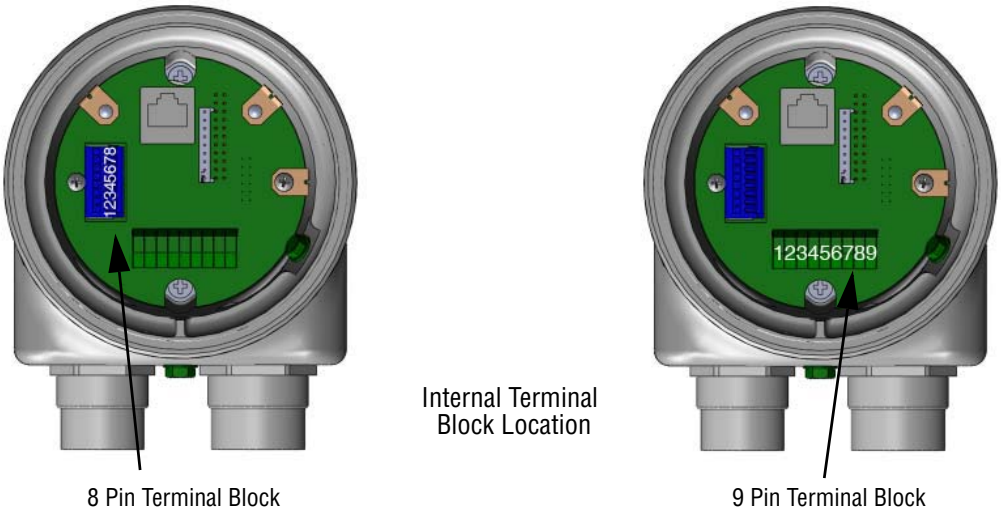
59-547-xx cable connector

QUICK DISCONNECT PINS

59-546 Cable Color	Function
Red	FR1-Relay NO
Black	FR1-Relay COM
Tan	FR1-Relay NC
Violet	Fault-Relay NO
Orange	Fault-Relay COM
Blue	FR2-Relay NC
Brown	FR2-Relay COM
Yellow	FR2-Relay NO

59-547 Cable Color	Function
Brown/Orange stripe	Comm - A
Orange/Black stripe	Comm - B
Blue /Black stripe	RFS1
Black/Yellow stripe	RFS2
Red/White stripe	4-20 mA OUT(+)(FR1)
Yellow/Black stripe	4-20 mA OUT RTN(-)
Red/Black stripe	4-20 mA OUT(+)(FR2)
Black/Orange stripe	Power (-) 24 VDC and 4-20 mA OUT RTN(-)
Blue/Red stripe	Power(+) 24 VDC
Brown/Black stripe	(no connection)
Violet/White stripe	(no connection)
Orange/White stripe	(no connection)

FIGURE 16. WIRING FOR 95DSS3-1WOC, 95DSS3-1CEX, 95DSS3-1WICEX SCANNERS



8-PIN TERMINAL BLOCK

59-546 Cable Color (if used)	Pin Number of Terminal Block	Function
Red	1	FR1-Relay NO
Black	2	FR1-Relay COM
Tan	3	FR1-Relay NC
Violet	4	Fault-Relay NO
Orange	5	Fault-Relay COM
Blue	6	FR2-Relay NC
Brown	7	FR2-Relay COM
Yellow	8	FR2-Relay NO

Wiring Notes:

Cage-clamp style terminal blocks. Small screwdriver required.

Wire Gauge: 24 AWG min., 16 AWG max.

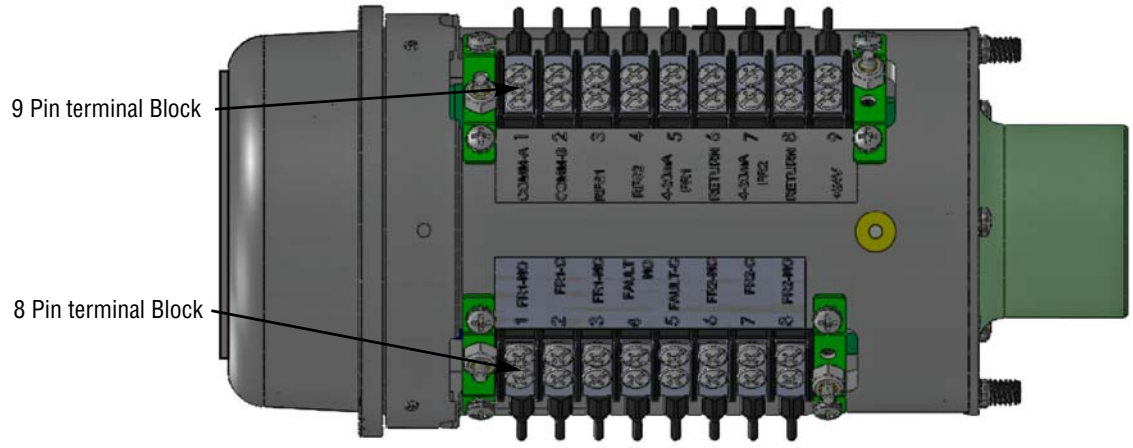
Wire strip length (8-Pin): 0.313" (8mm)

Wire strip length (9-Pin): 0.375" (9-10mm)

9-PIN TERMINAL BLOCK

59-547 Cable Color (if used)	Pin Number of Terminal Block	Function
Brown/Orange stripe	1	Comm - A
Orange/Black stripe	2	Comm - B
Blue /Black stripe	3	RFS1
Black/Yellow stripe	4	RFS2
Red/White stripe	5	4-20 mA OUT(+)(FR1)
Yellow/Black stripe	6	4-20 mA OUT RTN(-)
Red/Black stripe	7	4-20 mA OUT(+)(FR2)
Black/Orange stripe	8	Power (-) 24 VDC and 4-20 mA OUT RTN(-)
Blue/Red stripe	9	Power(+) 24 VDC
Brown/Black stripe	Cut	(no connection)
Violet/White stripe	Cut	(no connection)
Orange/White stripe	Cut	(no connection)

FIGURE 17. WIRING FOR 95DSS3-1CEXSS and 95DSS3-1CEX-2 scanners (shown with housing cover removed))



8-PIN TERMINAL BLOCK

59-546 Cable Color (if used)	Pin Number of Terminal Block	Function
Red	1	FR1-Relay NO
Black	2	FR1-Relay COM
Tan	3	FR1-Relay NC
Violet	4	Fault-Relay NO
Orange	5	Fault-Relay COM
Blue	6	FR2-Relay NC
Brown	7	FR2-Relay COM
Yellow	8	FR2-Relay NO

Wiring Notes:

Screw style terminal blocks. Small screwdriver required.

Wire Gauge: 24 AWG min., 16 AWG max.

Wire strip length: 0.375" (9-10mm)

9-PIN TERMINAL BLOCK

59-547 Cable Color (if used)	Pin Number of Terminal Block	Function
Brown/Orange stripe	1	Comm - A
Orange/Black stripe	2	Comm - B
Blue /Black stripe	3	RFS1
Black/Yellow stripe	4	RFS2
Red/White stripe	5	4-20 mA OUT(+)(FR1)
Yellow/Black stripe	6	4-20 mA OUT RTN(-)
Red/Black stripe	7	4-20 mA OUT(+)(FR2)
Black/Orange stripe	8	Power (-) 24 VDC and 4-20 mA OUT RTN(-)
Blue/Red stripe	9	Power(+) 24 VDC
Brown/Black stripe	Cut	(no connection)
Violet/White stripe	Cut	(no connection)
Orange/White stripe	Cut	(no connection)

REMOTE FILE SELECTION

The InSight II scanners have four (A,B,C,D) programmable memory files. The user has the option of storing different scanner setpoints for different operating conditions (e.g. Gas / Oil, Pilot / Main, Low Fire / High Fire, etc.) in these files. With RFS selected as "*Line Inputs*", one or two external switches (supplied by user) will select between the files when the RFS1 or RFS2 wires are connected to 24 vdc (-).

RFS1 (Blue/Black stripe)	RFS2 (Black/Yellow stripe)	File Selected
Open	Open	A
Closed	Open	B
Open	Closed	C
Closed	Closed	D

The default is *RFS = "Key Pad"* which allows manual file selection at the scanner keypad only. The user may also select *RFS = "Comms"* which will allow manual selection at a remote computer running Fireye software. Fireye recommends the use of shielded cable for the two remote file select switches (or relays). The switch contacts should be rated for low current operation (3mA dc).

WIRING FOR REMOTE COMMUNICATIONS

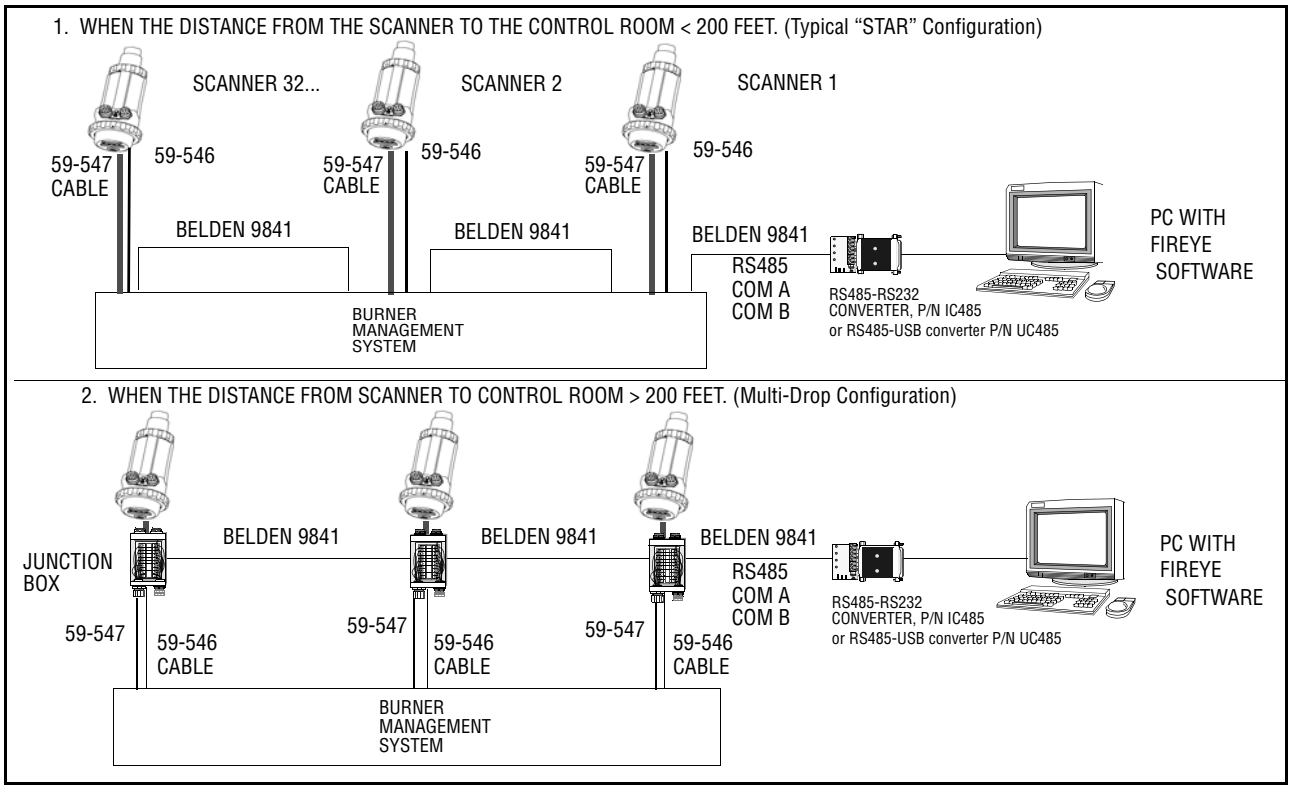
Remote communications with the InSight II scanner uses an RS485 Interface to carry the communication signals. A Windows® compatible PC running Fireye software is required to communicate with the flame scanners, see CU-109. **The wiring configuration for remote communications is dependent on the distance between the scanner and the control room.**

For distances less than 200 feet, wire the Fireye cable P/N 59-546 and 59-547 to the female quick disconnect in the manner previously described, and run the cable directly back to the burner management system.

For wiring distances when the InSight II scanner to the control room is greater than 200 feet, remote communications requires wiring a twisted, shielded pair of wires in a "multi-drop" wiring configuration. If communications problems occur, use a terminating resistor at the scanner located farthest from the communication source.

***Note**: The maximum distance for the communication wiring for all associated InSight scanners is 1,000 feet at 19200 baud. The maximum number of scanners connected to the communication link is 32 scanners. Exceeding this total wiring length or number of scanners requires the installation of bi-directional repeaters or amplifiers. Consult the factory for additional information.*

FIGURE 18. WIRING FOR REMOTE COMMUNICATIONS



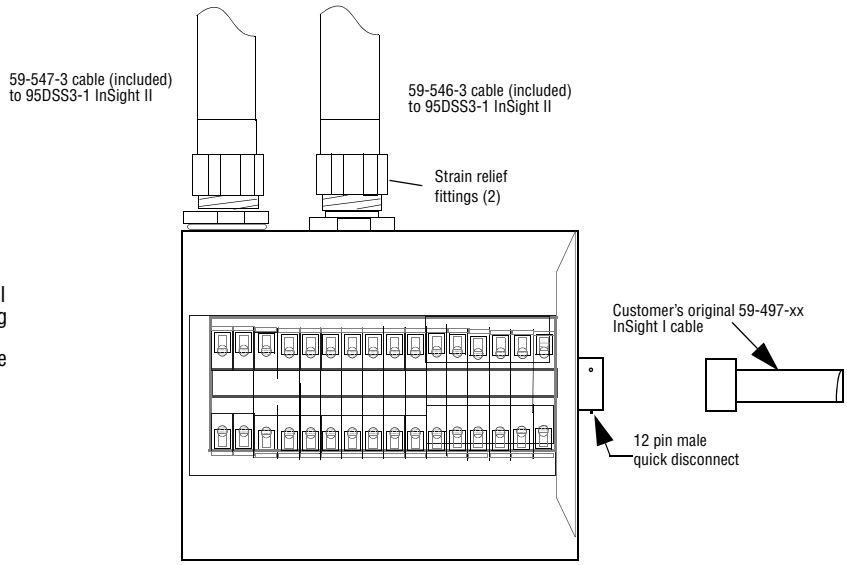
Conversion Harness, P/N 59-4647-10TB

Fireye offers the 59-4647-10TB Conversion Harness allowing users to replace an InSight I scanner with a model 95DSS3-1 InSight II scanner by attaching their existing InSight I cable to the connector on the harness junction box. The Conversion Harness includes two 3-meter (9 ft. 10 inch) cables, p/n 59-546-3 and 59-547-3, connecting the Harness to the InSight II scanner.

Note: The conversion harness is not required when using the model 95DSS3-1WINC.

FIGURE 19. INSIGHT I to INSIGHT II CONVERSION HARNESS (using existing InSight I cable)

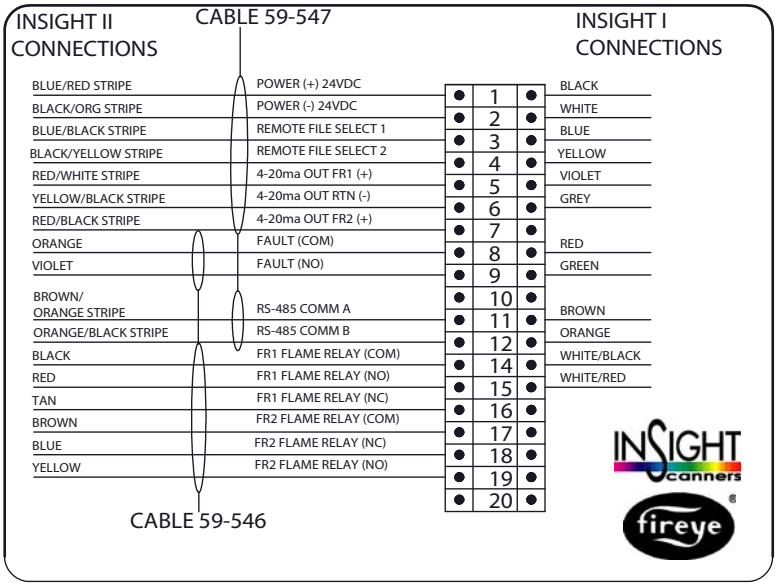
P/N 59-4647-10TB conversion harness will allow you to replace an InSight I scanner with a 95DSS3-1 InSight II scanner by attaching existing 59-497-xx InSight I cable to the connector on the harness junction box.


59-547-3 cable (included) to 95DSS3-1 InSight II
59-546-3 cable (included) to 95DSS3-1 InSight II
Strain relief fittings (2)
Customer's original 59-497-xx InSight I cable
12 pin male quick disconnect

P/N 59-4647-10TB Conversion Harness

Note: The conversion harness is not required when using the model 95DSS3-1WINC

FIGURE 20. WIRING DIAGRAM FOR P/N 59-4647-10TB CONVERSION HARNESS



GROUNDING AND SHIELDING TECHNIQUES

FOR USE ON SCANNERS OR SCANNER CABLE LOCATED WITHIN 12" OF A HIGH ENERGY OR HIGH VOLTAGE SOURCE.

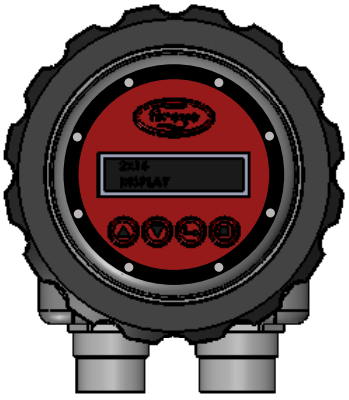
1. Connect a safety ground to scanner housing (Figure 13 & 14).
2. The scanner and scanner cable MUST be located at least 12" from the ignition source.
3. Run a ground wire from the ignition transformer chassis to the ignitor assembly.
4. Replace all frayed, cracked, or dirty (oily) ignition wire. Ignition wire must be in good working condition.
5. Electrically isolate the scanner from the burner using the surface mounting flange with integral heat-insulating female thread insert.
6. Cooling/Purge Air must be electrically isolated from the scanner (e.g. isolated short rubber hose).

SCANNER TO CONTROL ROOM	SHIELDING TECHNIQUES
Scanner with scanner cables (59-546, 59-547) wired directly back to burner management system. See below for remote communications.	Connect braided shield of 59-546, 59-547 cable to earth ground at power supply.
REMOTE COMMUNICATIONS: LESS THAN 200 FEET	
Scanner with scanner cables (59-546, 59-547) wired directly back to control room.	Connect braided shield of 59-546, 59-547 cable to earth ground at power supply.
REMOTE COMMUNICATIONS: GREATER THAN 200 FEET	
RS485 communications for scanners wired in a multi-drop configuration (Belden 9841) using wiring harness or junction box.	Connect braided shield of 59-546, 59-547 to earth ground at power supply. Twist together and tape (to electrically isolate) shield drains from Belden 9841 cables inside each wiring harness or junction box. Connect to earth ground at RS485 source (e.g. IBM computer).

PROGRAMMING THE INSIGHT II SCANNER

Keypad/Display:

The InSight II flame scanner uses a two (2) line x sixteen (16) character alphanumeric VFD Display and five (5) pushbuttons to review and program the various setpoints and operating parameters. The functions of the pushbuttons are:



UP/DOWN

The UP and DOWN buttons are used to scroll through the scanner menus. When in the EDIT menu, after selecting a setpoint to edit, (see SELECT button), the UP and DOWN buttons are used to change that setpoint.

SELECT

When in the EDIT menu, the UP / DOWN buttons are used to display the setpoints. Depressing the SELECT button displays the stored value of the setpoint, allowing it to be changed.

PROGRAM

The PROGRAM button saves a change made to a setpoint. It is also used to execute the Auto Tune function.

Note: Depressing and Holding the PROGRAM key for four (4) seconds will cause the scanner to RESET (flame relays and fault relay will de-energize). Normal operation will be restored once the PROGRAM button is released.

HELP

Pressing the Fireye logo will display expanded text in the Main Status Menu.

INSIGHT II MENU STRUCTURE

For ease of operation, the InSight II scanner contains five primary menus (or loops) accessed via the keypad and viewed on the scanner's display.

1. MAIN STATUS MENU

The Main Status menu is the default display. Use the UP and DOWN buttons to scroll through the menu and view the current operating status. No operating parameters can be changed from the Main Status menu. To change any setpoint, you must select the Configure Menu option and then enter a four digit password to enter the Configuration menu. Error History can also be viewed from the Main Menu.

Note: When power is applied, the following splash screen is displayed for 2 seconds:
"Display CRC=xxxx, Display Rev= xx".
After 2 seconds, the display will revert to the first display of the Main Status menu:
"1=OFF 2=0FF F=A, FQ 1:000 2:000".

2. CONFIG MENU

The Config Menu accesses all of the sub-menus, and setpoints for the InSight II scanner. The Config menu is entered from the Main menu after first entering a four-digit password. From the CONFIG menu the user can enter the AUTOMATIC CONFIG and MANUAL CONFIG and other menus.

3. AUTOMATIC CONFIG MENU

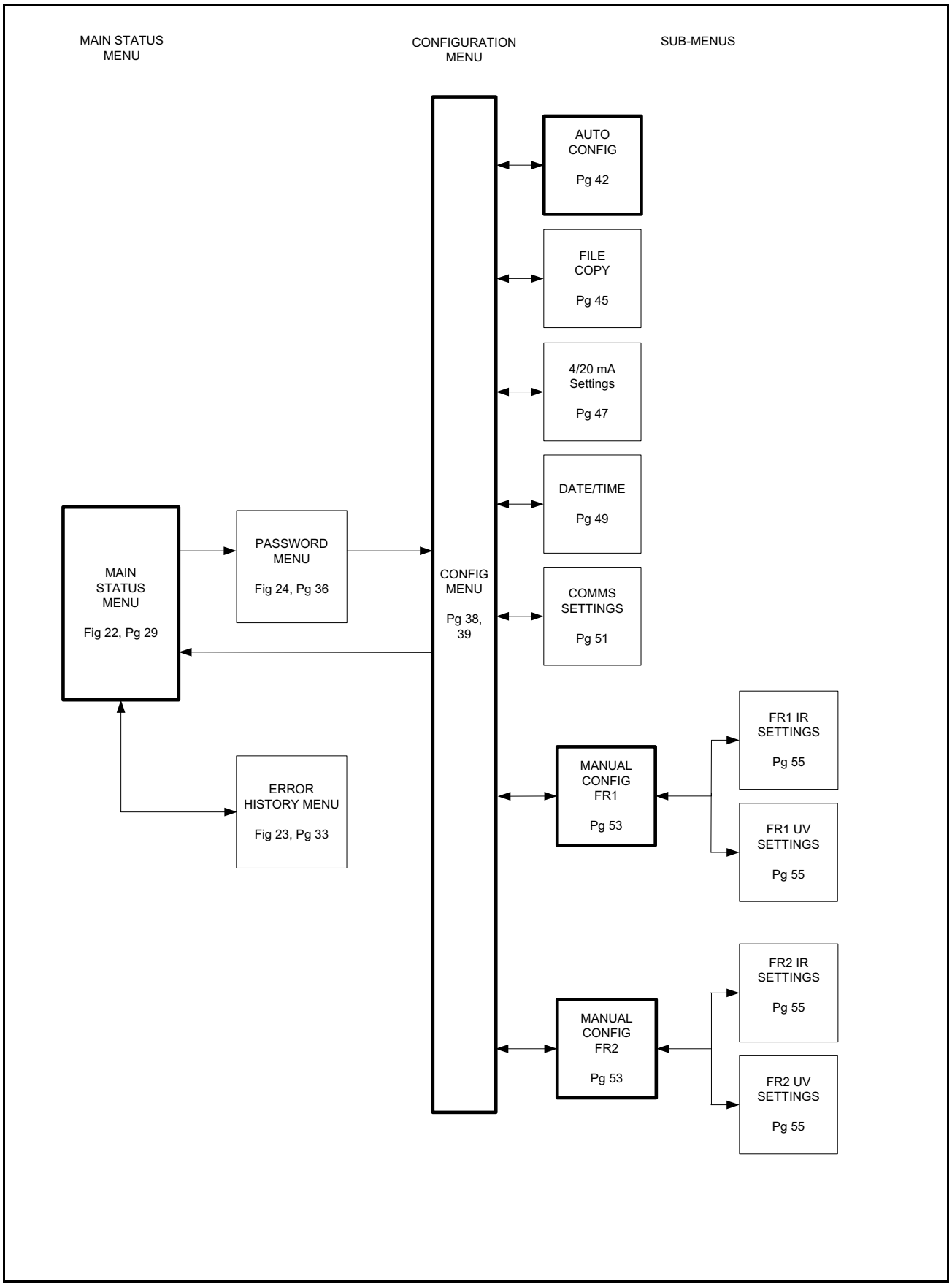
From the Automatic Config Menu, the user views the flame signal intensity while physically aiming the scanner for optimum signal. With the target burner ON (firing), and the scanner properly aimed, the user can command the InSight II scanner to Learn the Flame ON condition. With the target burner OFF (not firing), the user can command the InSight II scanner to Learn the Flame OFF condition. The scanner will then automatically select the optimum flame relay and sensor setpoints. The Automatic Config Menu is entered from the CONFIG menu.

4 & 5. MANUAL CONFIG MENUS

There are two Manual Config Menus, one for FR1 (flame relay 1) and the other for FR2 (flame relay 2) values. From the Manual Config Menu the user would select the desired FFRT (Flame Failure Response Time), and On Time Delay for the flame relays. From this menu, the user may also manually adjust all other flame relay and sensor setpoints. The Manual Config Menu is entered from the CONFIG menu.

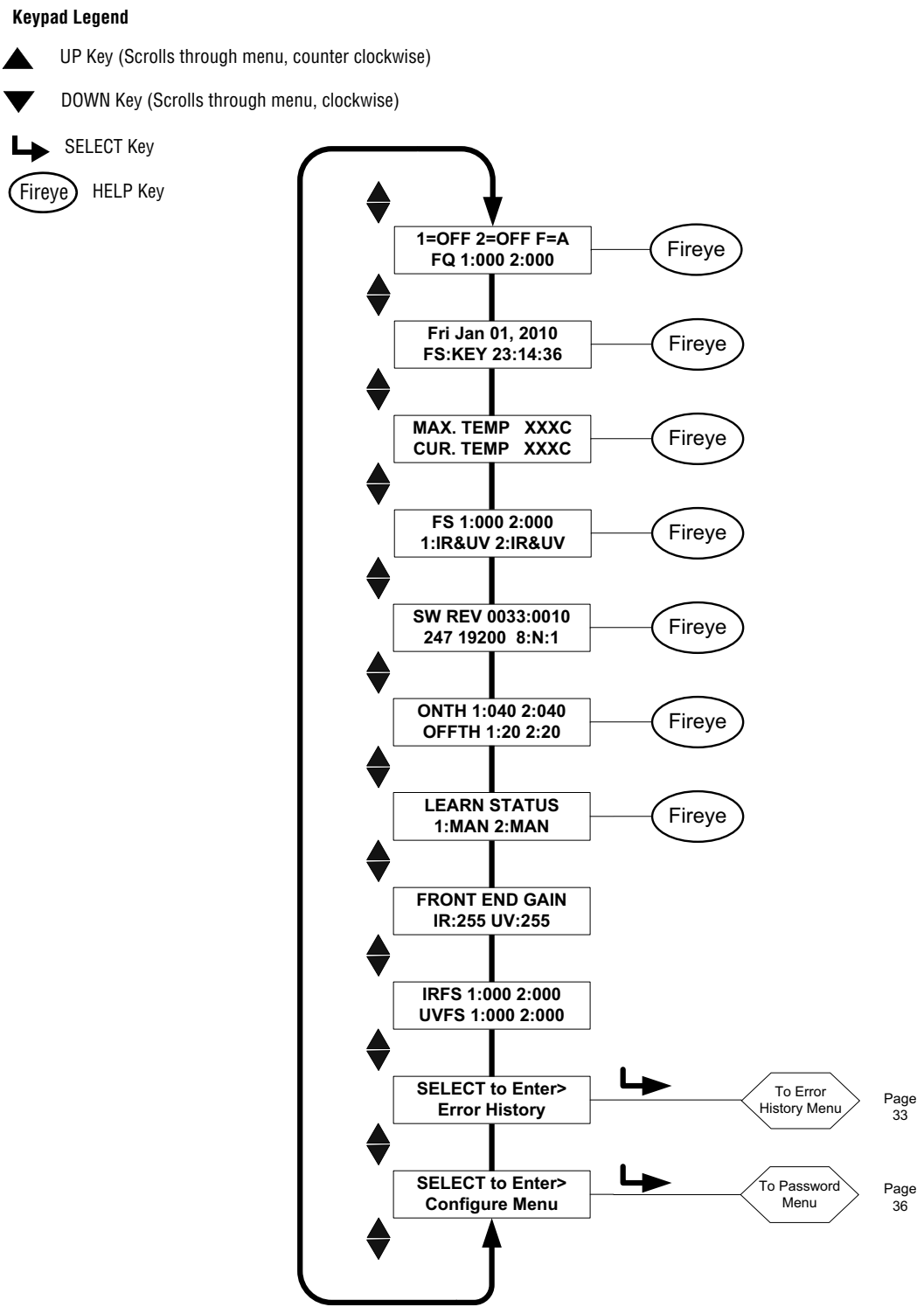
CAUTION: On **Engr Code 40 or lower**, do **not** set IR BAND (e.g., R1AIR-BAND) or UV BAND (e.g., R1AUV-BAND) parameters on either flame relay (R1 or R2) on any file (A,B,C, or D) to 165, 171, or 179. On Engr Code 40 or lower, these frequencies, if set in combination with manually adjusted high user gains (e.g., R1AIR-GAIN = 30) and/or lowered switching thresholds (e.g., R1A ON-THRESHLD = 15) may simulate the presence of flame when flame is not present. This combination of settings may cause your scanner to indicate a false flame condition.

FIGURE 21. INSIGHT II SCANNER MENU STRUCTURE



THE MAIN STATUS MENU

FIGURE 22. MAIN STATUS MENU LOOP



THE MAIN STATUS MENU

***Note*: HELP** text information for many main menu functions is displayed when you press the Fireye logo. The text will appear in the display for 3 seconds. If there are multiple lines of help information available, it will appear on sequential screens.

The first display in the Main Status Menu shows Flame ON/OFF status and the File selected (F=x) on the first line. The Flame Quality (FQ= xxx) for each of the two (2) flame relays is shown on the second line.

Flame ON/OFF

This item refers to the energized / de-energized status of the internal flame relays (FR1, FR2). 1=ON or 2=ON is displayed when the flame quality rises above the On Threshold set in the Config Menu. When the flame quality drops below the relay Off Threshold, 1=OFF or 2=OFF will be displayed.

File Selected

(F=x) displays the current running file. Four file choices are available (A, B, C, D).

Flame Quality

The “Flame Quality” number (FQ 1:xxx 2:xxx) for FR1 and FR2 can range from 0 to 100. The “Flame Quality” number is determined by the input sum of the IR and/or UV sensors. This sensor signal strength value can be viewed in the Main menu as “FQ 1:xxx 2:xxx”, see description below.

For clarity, the “Flame Quality” number is capped at 100, while under certain firing conditions, the sum of IR or UV signal strength may normally exceed 100 (maximum of 999).

In normal burner operation after the scanner has been properly setup, “FQ 100” will be displayed with occasional movement depending on the stability of the flame.

Important Note: The Flame Quality number is the Flame Signal number, but is capped at 100. It is the sum of the IR + UV Signal Strength numbers, assuming both sensors are used, but the sum is capped at 100.

Date/Time

The current Date and Time of day is displayed. If the scanner is powered off for more than 36 hours, this information will revert to system default values (Jan. 1, 2010) and the current Date and Time must be re-entered.

File Select Method

The Remote File Select option, KEY, LINE, COMM is displayed on this screen. (FS:KEY) indicates that the file selection can be made only via the Key Pad. (FS:COMM) indicates the file selection can be made only via an external computer running Fireye software, and (FS:LINE) indicates the file selection can be made only via an external switch or relay.

Maximum Temp

(MAX TEMP) This displays the highest internal scanner temperature recorded. This value toggles between degrees Fahrenheit and Celsius.

Current Temp

(CUR TEMP) This displays the current internal temperature of the scanner unit. This value toggles between degrees Fahrenheit and Celsius.

Flame Signal Strength, Combined Sensors

The Flame Signal for FR1, FR2 (FS 1:xxx 2:xxx) number represents the intensity of the Flame Flicker as sensed by the IR and/or UV sensors, and is a function of the individual sensor Gain and Bandpass (flicker frequency) settings. If IR & UV is selected, the sum of their signals is displayed. The Signal Strength number is related to the Flame Quality number but has a value of 0-999.

Important Note: The Flame Quality number is the Flame Signal number, but is capped at 100. It is the sum of the IR + UV Signal Strength numbers, but the sum is capped at 100.

Example:

If “FS 1:080 2:015” is displayed as signal strength, you would see a Flame Quality number (the IR and UV signal sum) of “FQ 95” displayed on the Flame Quality screen.

If “FS 1:070 2:040” is displayed as signal strength, although the *sum* is 110, you would see a Flame Quality number of “FQ 100” on the Flame Quality screen, because Flame Quality is capped at 100.

Active Sensor

The active sensor in use for FR1 and FR2 is displayed on this screen. Valid values can be 1:IR, 1:UV, 1:IR&UV and 2:IR, 2:UV, 2:IR&UV to represent the possible combinations available.

Software Revision

This displays the current internal software revision, “ex: SW REV 0033:0010”

Comms

This screen indicates the remote communications address, baud rate, bits, parity, and stop bit. The address can range from 1 to 247, as selected in the Config Menu. No two scanners in a communications loop should have the same address. Default comm values are: “247 19200 8:N:1”, indicating address 247, 19200 baud, 8 bits, No parity, 1 stop bit.

Flame Relay Thresholds

Each flame relay has a factory programmed FLAME ON threshold of 40, and a FLAME OFF threshold of 20 (0-100 scale). Other ON and OFF thresholds may be programmed to suit particular applications.

On Threshold

Flame ON threshold (ONTH 1:xxx 2:xxx) This refers to the “pull-in” threshold of the internal Flame Relay in terms of Flame Quality. The ON threshold can be set from 5 to 100. The ON threshold must be at least 5 units higher than the OFF threshold. When the flame quality is equal to or greater than the ON threshold (for a time equal to the On Time Delay setting), the flame relay will energize. Factory default ONTH value for FR1, FR2 is 40

Off Threshold

Flame OFF threshold (OFFTH 1:xxx 2:xxx). This refers to the “drop-out” threshold of the internal flame relay in terms of Flame Quality. The OFF threshold can be set from 0 to 95. The OFF threshold must be at least 5 units lower than the ON threshold. When the Flame Quality is equal to or less than the OFF threshold (for a time equal to the Flame Failure Response Time setting), the flame relay will de-energize. Factory default OFFTH value for FR1, FR2 is 20

Learn Status

Status values can be MAN, ON, OFF, or BOTH. (see note)

MAN: Manual mode, no Learning done, or USER has changed at least ONE of the learned parameters.
ON: Learn ON is done, OFF is not done.
OFF: Learn OFF is done, ON is not done.
BOTH: Both Learn ON and OFF have been done. (see note)

***Note**: If a user conducts both a Learn On and a Learn Off, then changes any value effecting the flame calculations, the status will read MANUAL.*

Front End Gain

The InSight II scanner has automatic gain control circuitry that continuously adjusts the scanner's Front End Gain (FEG). The purpose is to keep the raw flame signal within measurable limits. The FEG value can range from 5 to 255. The current "real-time" Front End Gain value is displayed on this screen.

With a very weak dim flame (or in darkness) the automatic gain control circuit would increase the FEG, (up to a maximum value of 255). With a very bright flame, the automatic gain control would decrease the FEG, (down to a minimum value of 5).

The scanner stores the current real-time FEG value any time a Learn Flame ON procedure is performed. **To assist in proper flame discrimination, the Flame Quality number will be automatically reduced whenever the real-time FEG value is higher than the Learned FEG value.**

Example: If the Learned FEG value was 20, and the real-time FEG is now 40, (indicating a *dimmer* flame), the scanner will *decrease* the Flame Quality number by 50% (20/40). However, if the Learned FEG value was 20, and the real-time FEG is now 10, (indicating a *brighter* flame), the Flame Quality number will not be affected.

Flame Signal Strength, Individual Sensors

This screen shows the *individual sensor's contribution* to the Flame Quality number. Each value is identified by the corresponding Flame Relay (1:, 2:) indicating whether it is the IR, or UV sensor.

Example 1: "IRFS 1:060 2:010, UVFS 1:030 2:070"

For Flame Relay 1, the infrared sensor has a current Flame Signal of 60, and the ultraviolet sensor has a Flame Signal of 30. The *Flame Quality* displayed would be their sum of 90.

For Flame Relay 2, the infrared sensor has a current Flame Signal of 10, and the ultraviolet sensor has a Flame Signal of 70. The *Flame Quality* displayed would therefore be their sum of 80.

Example 2: "IRFS 1:120 2:150, UVFS 1:220 2:000"

For Flame Relay 1, the infrared sensor has a current Flame Signal of 120, and the ultraviolet sensor has a Flame Signal of 220. Although their sum is 340 the *Flame Quality* display will be capped at 100.

For Flame Relay 2, the infrared sensor has a current Flame Signal of 150, and the ultraviolet sensor has a Flame Signal of 0. Although their sum is 150 the *Flame Quality* display will be capped at 100.

Select To Enter Error History

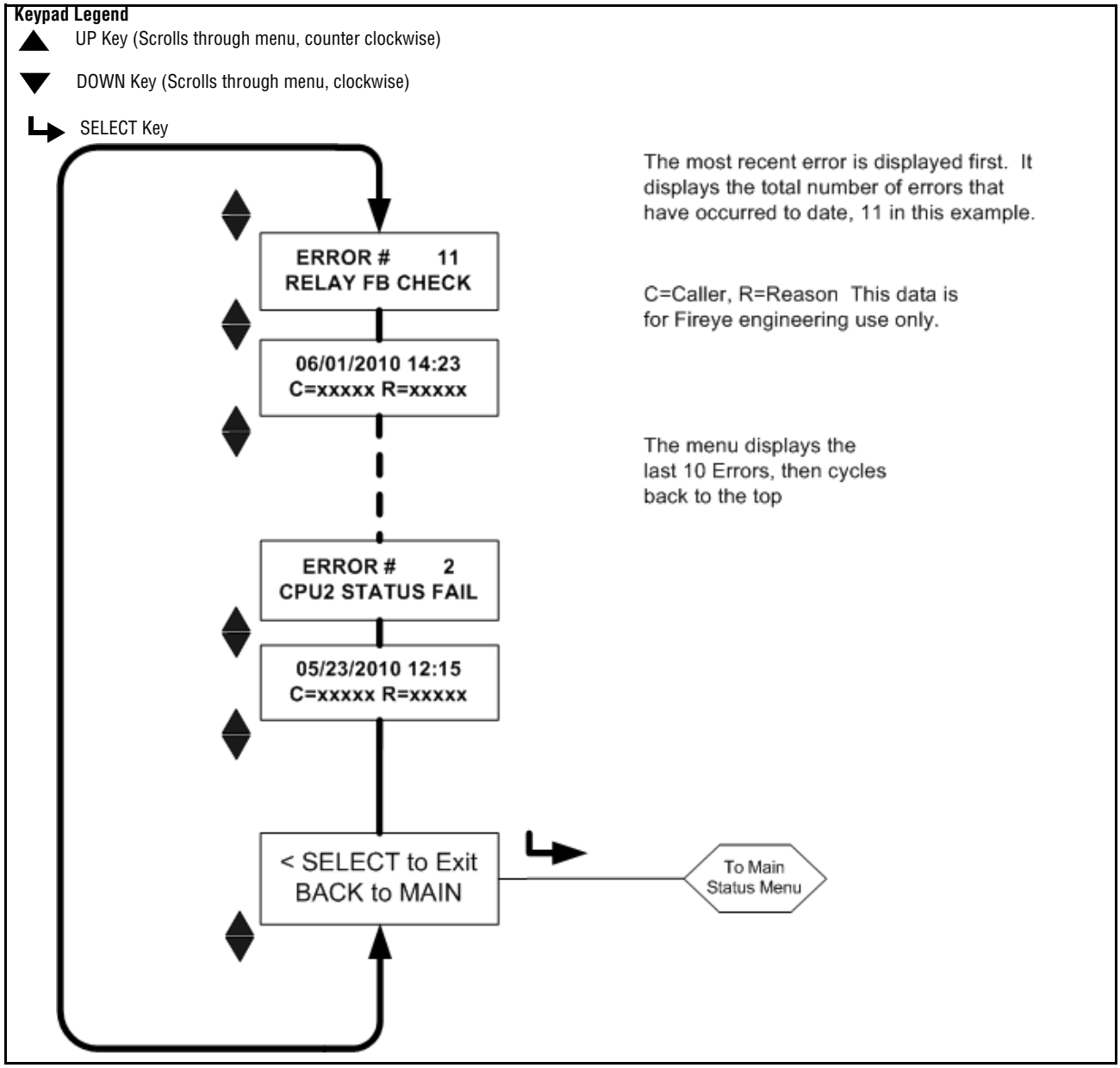
Press Select Key to enter the Error History screen to view error status and codes. The most recent Error is displayed first. It also tells the NUMBER of errors that have occurred to date. The date and time of each error is displayed along with the Caller and Reason number. The Error menu displays the last 10 errors, then cycles back around to the top level. In the event that an internal scanner fault is detected, the scanner will turn off its output and an error code will appear on the display.

To clear the error code and restart the scanner, either the 24 vdc power can be cycled off then on, or the PROGRAM key can be depressed and held for four (4) seconds.

Note: Depressing and Holding the PROGRAM key for four (4) seconds will cause the scanner to RESET (flame relays and fault relay will de-energize). Normal operation will resume once the PROGRAM button is released.

THE ERROR HISTORY MENU

FIGURE 23. ERROR HISTORY MENU LOOP


Keypad Legend
UP Key (Scrolls through menu, counter clockwise)
DOWN Key (Scrolls through menu, clockwise)
SELECT Key
ERROR # 11
RELAY FB CHECK
06/01/2010 14:23
C=xxxxx R=xxxxx
ERROR # 2
CPU2 STATUS FAIL
05/23/2010 12:15
C=xxxxx R=xxxxx
< SELECT to Exit
BACK to MAIN
To Main
Status Menu
The most recent error is displayed first. It displays the total number of errors that have occurred to date, 11 in this example.
C=Caller, R=Reason This data is for Fireye engineering use only.
The menu displays the last 10 Errors, then cycles back to the top

Internal Error Messages

DISPLAYED WHEN ERROR OCCURS	DISPLAYED LATER IN ERROR HISTORY MENU
INTERNAL STORAGE R/W ERROR	FRAM WRITE FAIL
INTERNAL STORAGE R/W ERROR	FRAM READ FAIL
WATCH DOG FAILURE	WATCH DOG FAIL
INTERNAL RAM CHECK FAILURE	RAM TEST FAIL
INTERNAL RAM CHECK FAILURE	BI RAM TEST FAIL
INTERNAL VOLTAGE CHECK FAILURE	VOLTAGE TEST
RELAY FEEDBACK CHECK FAILURE	RELAY FB CHECK
INTERNAL CPU1 INIT FAILURE	FAILED INIT
INTERNAL STORAGE MEMORY CORRUPTED	INVALID FRAM
INTERNAL STORAGE MEMORY CORRUPTED	WRONG FRAM REV
INTERNAL CPU2 STATUS FAILURE	CPU2 STATUS FAIL
INTERNAL CPU1 CRC FAILURE	CRC ERROR
CONFIGURATION CHECK FAILED	CONFIG ERROR
CPU1 SELF CHECK FAILED TEST # xx	SELF CHECK ERROR
GENERAL FIRMWARE CHECK FAILED	GENERAL ERROR
LOCKOUT UNDEFINED ERROR	UNKNOWN REASON

Select To Enter Configure Menu

Pressing the Select Key will bring you to the Password Entry Screen before accessing the Configuration menu. The Configuration Menu will allow the user to select Active File, Change Password, Select IR & UV Gain, enter Automatic Configuration menu, enter File Copy, COMMs Settings, change Date/Time, enter 4/20 mA settings and Manual Configuration menus.

Warning Messages

In the event of an abnormal operating condition the fault LED is lit and the scanner will automatically display a warning message informing the user of the condition. The warning message will be displayed for two (2) seconds, then the standard status message will be displayed for ten (10) seconds. This pattern will be repeated until the abnormal condition no longer exists, or until the user depresses any key. If the user depresses any key, the warning message will be suppressed for thirty (30) seconds.

Group I Warning Messages (Always Active)

Warning Message	Condition	Effect
TOO COLD < -40C Currently –xxC FLAME SIGNALS SET TO 0	The scanner's internal temperature has fallen to -40C (-40F), or below. Note: There is a 2°C hysteresis window (-38°C) until cold warning displayed.	The UV and IR flame signals are driven to zero. The Fault relay and Flame relays will be de-energized.
COLD WARNING Currently –xxC	The scanner's internal temperature has fallen to -35C (-31F) or below	The Fault relay will be de-energized.
HOT WARNING Currently +xxC	The scanner's internal temperature has risen to +80C (+176F), or higher	The Fault relay will be de-energized.
TOO HOT > 85C Currently +xxC FLAME SIGNALS SET TO 0	The scanner's internal temperature has risen to +85C (+185F), or higher. Note: There is a 2°C hysteresis window (83°C) until hot warning displayed.	The UV and IR flame signals are driven to zero. The Fault relay and Flame relays will be de-energized.
IR SENSOR IS SATURATED	The steady (DC) component of the IR source is too strong (the flame is too bright). The scanner cannot properly detect the flame flicker. (See notes 3,4).	The IR flame signal will become erratic or go to zero.

Group II Warning Messages (Can be suppressed, see Note 1)

Warning Message	Condition	Effect
FRx IR FEG LESS THAN MINIMUM	The IR FEG (Front-End-Gain) has dropped below the MIN value selected by the user in the IR Settings Menu (see Note 2).	The IR flame signal is driven to zero.
FRx IR FEG GREATER THAN MAXIMUM	The IR FEG (Front-End-Gain) has risen above the MAX value selected by the user in the IR Settings Menu (see Note 2).	The IR flame signal is driven to zero.
FRx UV FEG LESS THAN MINIMUM	The UV FEG (Front-End-Gain) has dropped below the MIN value selected by the user in the UV Settings Menu (see Note 2).	The UV flame signal is driven to zero.
FRx UV FEG GREATER THAN MAXIMUM	The UV FEG (Front-End-Gain) has risen above the MAX value selected by the user in the UV Settings Menu (see Note 2).	The UV flame signal is driven to zero.
FRx FAILED THE IR LIGHT CHECK	The IR source is likely not a real flame. The scanner uses a “single-source” light check to reject incandescent or fluorescent light sources.	The IR flame signal is driven to zero.
FRx FAILED THE UV LIGHT CHECK	The UV source is likely not a real flame. The scanner uses a “single-source” light check to reject incandescent or fluorescent light sources.	The UV flame signal is driven to zero.
TOO MUCH IR SIGNAL	The flickering (AC) component of the IR source is too strong. The scanner cannot properly detect the flame flicker. (See notes 3,4).	The IR flame signal will become erratic or go to zero.
TOO MUCH UV SIGNAL	The flickering (AC) component of the UV source is too strong. The scanner cannot properly detect the flame flicker. (See notes 3,4).	The UV flame signal will become erratic or go to zero.

Notes

1. Group II Warning messages are suppressed whenever “Do NOT Display” is selected under the FS Squelch Msgs parameter in the CONFIG menu. This is the default setting. Although the *message* will be suppressed, if the Group II Warning *condition* exists, the appropriate flame signal will still be driven to zero. To display the Warning messages, select “Display” under the FS Squelch Msgs parameter.

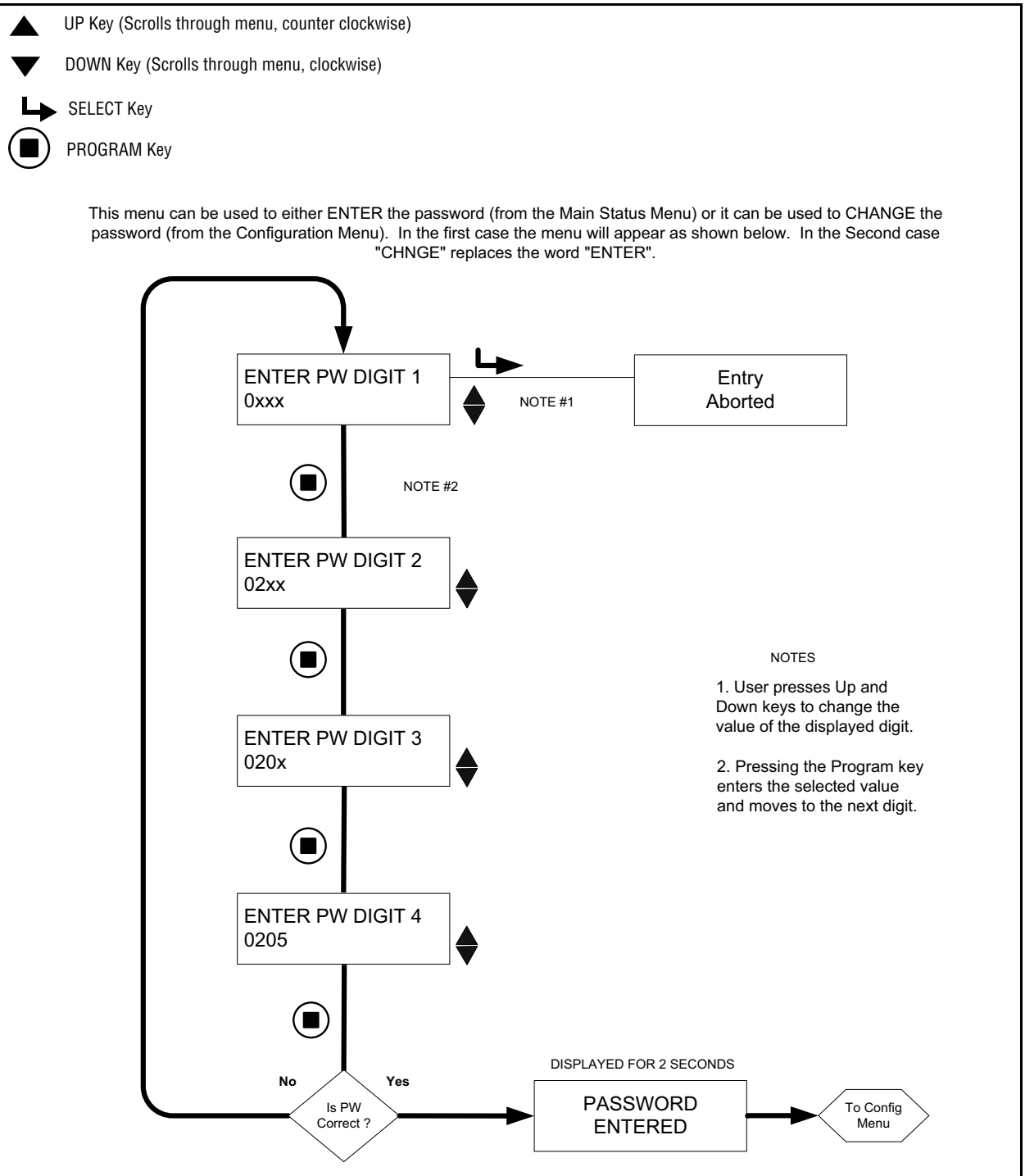
2. An “FEG” Warning condition could only exist if the user had manually changed the MIN or MAX value for the FEG range in the IR and UV Settings Menus. The default settings for these parameters are 5 and 255 respectively.

3. This message is only active if the affected sensor, IR or UV, has been selected.

4. Excess signal for a specific sensor (IR or UV) will be reduced by setting the Sensor’s (IR or UV) Gain Range to a lower Setting. See Figure 25 on page 38. Additionally, installing a sight pipe orifice will simultaneously lower BOTH IR and UV measurable flame signals and so is a preferential solution than using the individual sensor Gain Range settings.

THE PASSWORD MENU

FIGURE 24. PASSWORD MENU LOOP


UP Key (Scrolls through menu, counter clockwise)
DOWN Key (Scrolls through menu, clockwise)
SELECT Key
PROGRAM Key
This menu can be used to either ENTER the password (from the Main Status Menu) or it can be used to CHANGE the password (from the Configuration Menu). In the first case the menu will appear as shown below. In the Second case "CHNGE" replaces the word "ENTER".
ENTER PW DIGIT 1
0xxx
NOTE #1
Entry Aborted
NOTE #2
ENTER PW DIGIT 2
02xx
ENTER PW DIGIT 3
020x
ENTER PW DIGIT 4
0205
NOTES
1. User presses Up and Down keys to change the value of the displayed digit.
2. Pressing the Program key enters the selected value and moves to the next digit.
No
Yes
Is PW Correct ?
DISPLAYED FOR 2 SECONDS
PASSWORD ENTERED
To Config Menu

THE PASSWORD MENU

Password

A four-digit Password is required to enter the CONFIG menus. If a Password is not entered, pressing the SELECT key will advance directly to the "Flame Quality" display.

To enter the CONFIG menus, you must enter the four-digit Password. **The following example is for the factory installed password of 0205:**

1. With "SELECT to Enter Configure Menu" displayed, depress the SELECT key. "**0**xxx" will be displayed, the first digit ("0") is adjustable. (If the factory password was changed, use the UP/DOWN keys to select the appropriate first digit).
2. With the first digit selected (e.g. "0xxx") depress the PROGRAM key. "00xx" will be displayed, the second digit ("0") is adjustable. Depress the UP key twice to display "2". (If the factory password was changed, use the UP/DOWN keys to select the appropriate second digit).
3. With the second digit selected (e.g. "02xx") depress the PROGRAM key. "02**0**x" will be displayed, the third digit ("0") is adjustable. (If the factory password was changed, use the UP/DOWN keys to select the appropriate third digit).
4. With the third digit selected (e.g. "020x") depress the PROGRAM key. "020**0**" will be displayed, the fourth digit ("0") is adjustable. Depress the UP key five times to display "5". (If the factory password was changed, use the UP/DOWN keys to select the appropriate fourth digit).
5. With all four digits selected (e.g. "0205") depress the PROGRAM key.

If the Password was not entered correctly, the display will return to "ENTER PW DIGIT 1". Use the UP/DOWN keys to select the appropriate first digit.

If the Password was entered correctly, the display will read "PASSWORD ENTERED. To change the password, Press DOWN key once to PASSWORD. If you wish to change the password at this time, Press the SELECT key see the "Change Password" section below. Otherwise, depress the DOWN key to advance to the CONFIG menus.

Entering the correct Password allows the user 20 minute access to the CONFIG menus. Saving any parameter will re-start this 20 minute time-out period. When the user returns to the MAIN STATUS menu, the password will immediately expire. The password must be re-entered if it is necessary to return to the CONFIG menu.

Change Password

The user may change the password **(the factory set password is "0205")** to any four-digit code desired. To change the password, you first enter the current password as described above.

Scroll until the display reads "PASSWORD". Press SELECT and "CHNGE PW DIGIT 1 0xxx" is displayed. The first digit "0" is adjustable. For example, to enter a NEW password of "1357", use the UP/DOWN key and the PROGRAM key as described in the above section. When complete, the display will briefly read "PASSWORD CHANGED 1357".

Removing Password Protection

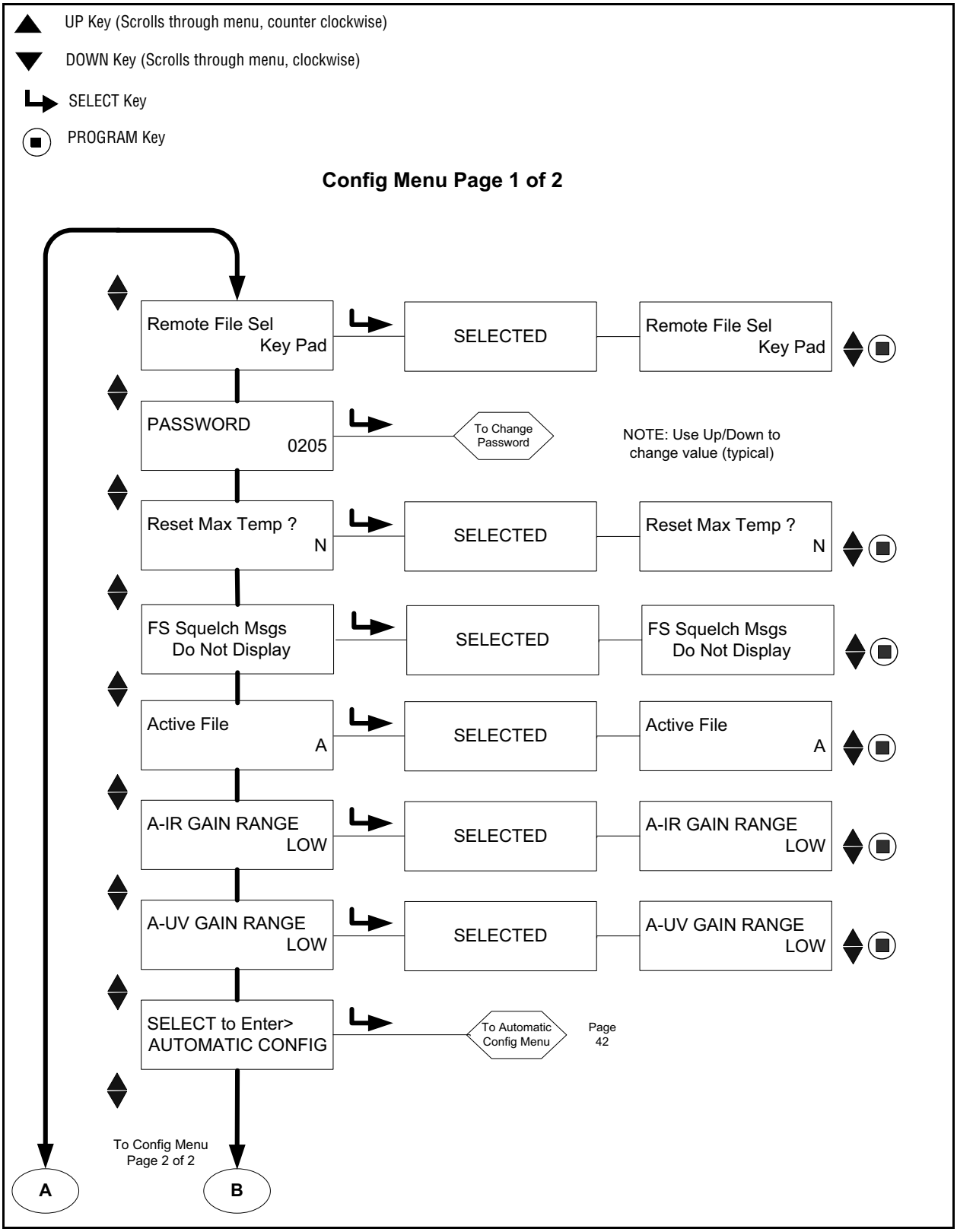
The user may choose to disable / remove password protection for an extended period of time during commissioning, and then restore password protection at a later time when commissioning is complete.

To remove password protection, first enter the current password, and then change it to "0000" following the steps described in the Change Password section above. When the password has been changed to "0000", the user will no longer be prompted to enter a password to gain access to the CONFIG menus.

To restore password protection, enter the CONFIG menu and depress the DOWN key until "PASSWORD 0000" is displayed. Press the SELECT key and follow the steps described in the Change Password section above to change from "0000" to either the as-shipped password of "0205", or to any other four-digit code desired.

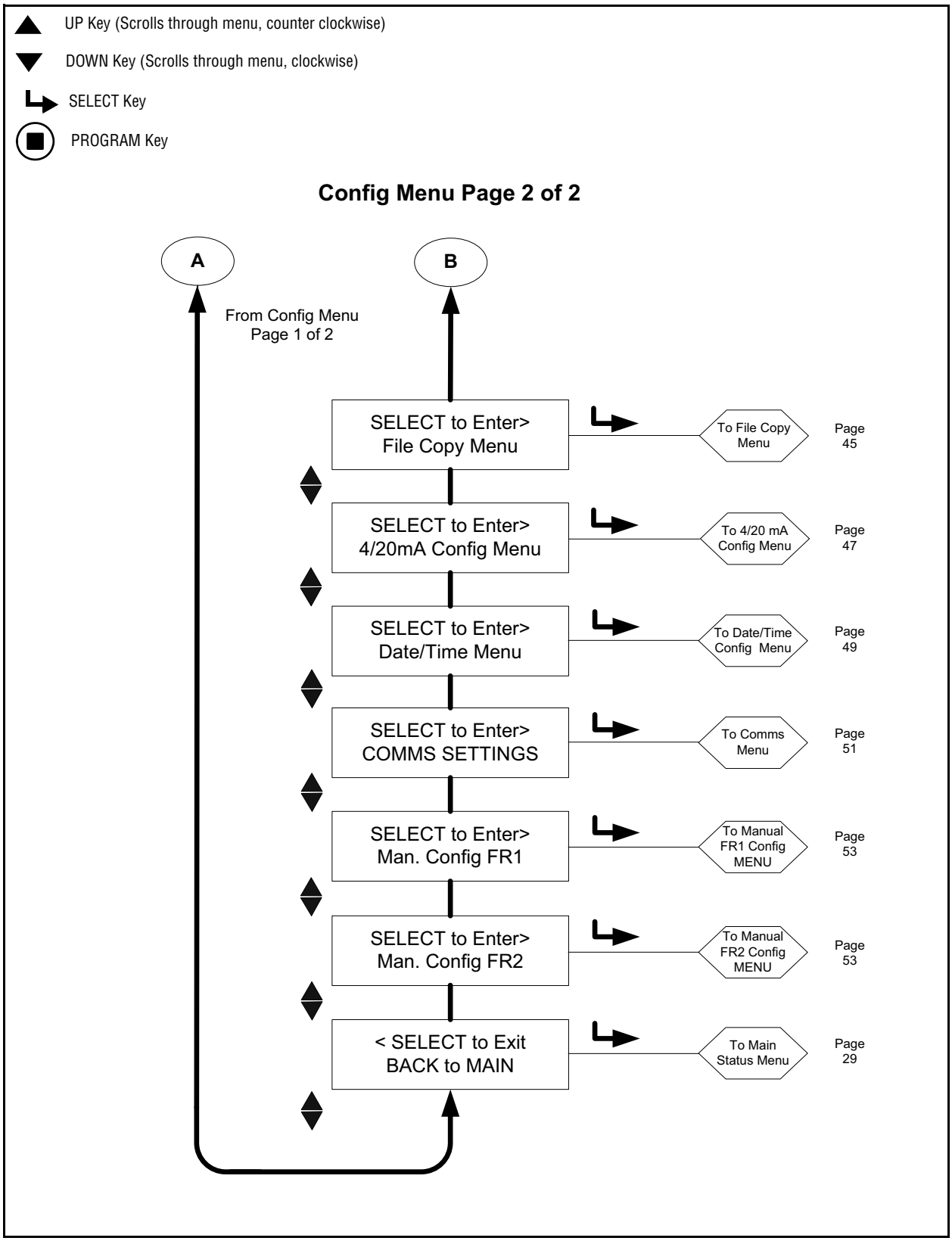
THE CONFIG MENU

FIGURE 25. CONFIG MENU LOOP



THE CONFIG MENU (continued)

FIGURE 26. CONFIG MENU LOOP



THE CONFIG MENU

To select a specific item to change from the Config Menu, scroll to it using the UP and DOWN arrows, then press the SELECT button. (To exit the viewed value without changing it, press the SELECT button again). To change a value, press the UP / DOWN keys until the desired value is displayed. Depress the PROGRAM button. The display will scroll "NEW VALUE SAVED", then automatically de-select the menu choice as if the SELECT button had been pressed. See note below.

Note: *You may only Edit the File that the scanner is currently running. For example, to Edit file "B", you must be currently running file "B". (See File Select section).*

Remote File Sel

Affects all files. Choices for Remote File Select are: Key Pad, Line Inputs, Comms

Key Pad allows the file selection to be made **only** at the scanner keypad
Line Inputs allows the file selection to be made **only** via an external switch or relay.
Comms allows the file selection to be made **only** via an external computer running Fireye Software.

PASSWORD

The user may change the password to any four-digit code desired. See Password Menu for details.

Reset Max Temp

The user may reset the highest internal temperature value that the scanner has recorded. The Max Temp will then be equal to the current internal temperature value.

FS Squelch Msgs

Under certain operating conditions, such as Front End Gain (FEG) out-of-limits, the UV or IR Flame Signal may be driven to zero (squelched) by the scanner's control algorithm. The user can choose to Display, or to NOT Display, the Warning Messages that notify the user that the flame signal is being squelched. The default choice is to NOT Display these messages. The specific messages affected are listed in the Group II Warning Messages section on page 35.

Active File

The user can manually choose which file to run (and to Edit) by selecting this menu choice *provided the Remote File Select "Key Pad" choice is selected* (see above). If the user wants to Edit the contents of a file, they must first select and run that particular file, (A, B, C, D).

A-IR GAIN RANGE

The "A" indicates the active file selected. There are selectable internal "ranges" for the IR sensor Gain. If, when "Aiming" the scanner, a flashing "IR TOO HIGH" message is observed, then the signal is over-range and the "Range" should be reduced. If, when "Aiming" the scanner, an IR number of less than 10 is observed, then the gain Range should be increased.

A-UV GAIN RANGE

The "A" indicates the active file selected. There are selectable internal "ranges" for the UV sensor Gain. If, when "Aiming" the scanner, a flashing "UV TOO HIGH" message is observed, then the signal is over-range and the "Range" should be reduced. If, when "Aiming" the scanner, a UV number of less than 10 is observed, then the gain Range should be increased

Note*: *The scanner has selectable internal Gain "Ranges" for each IR and UV sensor. Scanners with Engineering Code 00 through 04 have two ranges for each sensor, "LOW" and "HIGH". Scanners with Engineering Code 05 and higher have three ranges for each sensor, "LOW", "MED" and "HIGH". Scanners with Engineering code 09 and higher have five ranges for IR, "LOW", "LOW+1", "LOW+2", "MED", and "HIGH".

SELECT to Enter AUTOMATIC CONFIG

Press the SELECT key to enter Automatic Configuration menu. This option will walk you through the configuration process beginning with AIM, Set IR and UV Gain Range, Learn ON (FR1, FR2 or FR1 & FR2), Learn OFF (FR1,FR2 or FR1&FR2) **Refer to AUTOMATIC CONFIG Menu.**

SELECT to Enter File Copy Menu

This function allows the user to copy the contents of one internal scanner file to another. There are four user configurable files, “A,B,C,D”, plus three factory configured files, “F1, F2, F3”. **Refer to “FILE COPY MENU” for details.**

SELECT to Enter 4/20 Config Menu

This option allows the user to select which parameter the 4-20 ma analog output represents. The choices are “Flame QUALITY” or “Flame SIGNAL”. **Refer to** “**THE 4/20 mA MENU**” **section for details.**

When Flame QUALITY is selected, the 4-20 ma range (20 mA MAP Value) may be set anywhere from 40 to 100.

When Flame SIGNAL is selected, the 4-20 ma range (20 mA MAP Value) may be set anywhere from 400 to 999.

SELECT to Enter Date/Time Menu

This option allows the user to enter the current date and time into the scanner. Press the select key to see the year value. To change the year, press SELECT again, then use the UP and DOWN arrows to scroll to the correct year. Press PROGRAM to save this value. Press DOWN arrow to view the MONTH. To change the month value, press SELECT, scroll UP or DOWN to the correct MONTH and press PROGRAM. Press DOWN arrow to DAY of the MONTH. Press SELECT, scroll to current DAY and press PROGRAM to Save. You can enter HOUR, MINUTES, SECONDS by following the process outlined above. If the scanner is turned off for more than 36 hours, the date/time will revert back to the system default (Jan. 1, 2010) and current settings must be reentered. **Refer to “DATE/TIME MENU” for details.**

SELECT to Enter COMMS SETTINGS (Affects all files)

The communications address selected may range from 1 to 254. Each scanner must have a unique address. No two scanners in a communications loop can have the same address. Press SELECT to change COMMS values. Press SELECT to change MODBUS Address. Scroll UP/DOWN to the address desired and press PROGRAM key to save value. Default address is 247. Press DOWN key to see BAUD rate. Default BAUD rate is set at 19200. To change this value, press Select, scroll UP/DOWN to rate desired and press PROGRAM key to save. Default PARITY is set to 8/N/1. Other Parity values available are 8/O/1, 8/N/2 and 8/E/1. Follow the procedure above to change the PARITY. **See “THE COMMS MENU” for details.**

SELECT to Enter Man. Config FR1

This option allows the user to enter Manual Configuration mode for Flame Relay 1 (FR1).

See Manual Configuration section.

SELECT to Enter Man. Config FR2

This option allows the user to enter Manual Configuration mode for Flame Relay 2 (FR2).

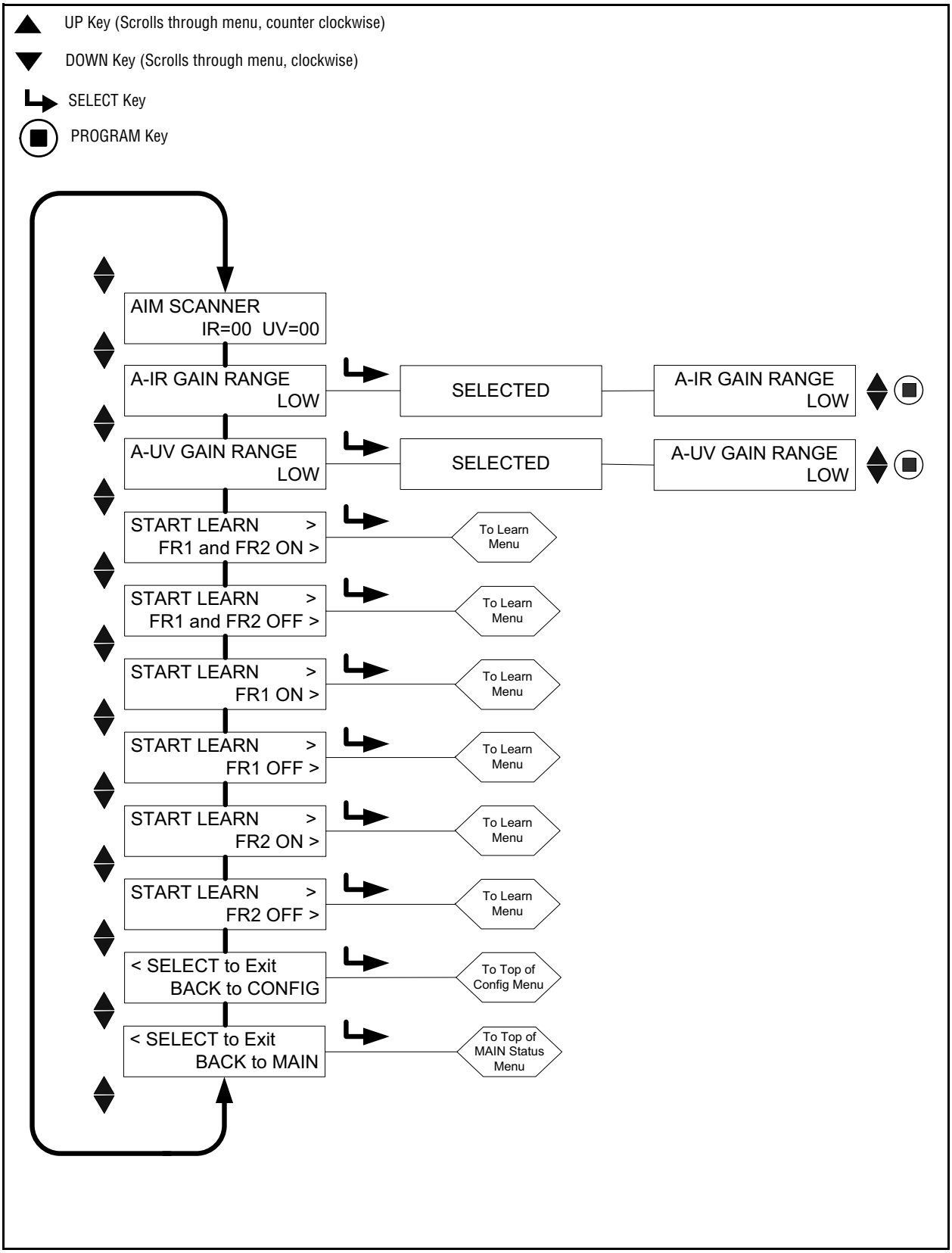
See Manual Configuration section.

SELECT to Exit BACK to MAIN

Returns user to the Main Status Menu

THE AUTO CONFIG MENU

FIGURE 27. AUTO CONFIG MENU LOOP



THE AUTO CONFIG MENU

Auto Configuration is an automatic calibration function whereby the InSight II scanner scans the flame flicker frequency spectrum with flame ON, and with flame OFF (background radiation present). The scanner will then select the appropriate sensor, sensor gain, and bandpass frequency for optimum flame ON: OFF discrimination.

Note: *The Auto Config function allows the user to perform the Learn Flame ON and Learn Flame OFF procedures for flame relays FR1 and FR2 either together or separately.*

Auto Config is performed in 3 steps:

1. Run the target flame at the low firing rate. Enter the Automatic Config menu loop, and "AIM SCANNER" is displayed. Physically aim the scanner for peak signal strength as described in the "Aim Scanner" section below. Press the DOWN key when complete.
2. Press the DOWN key until the appropriate "START LEARN... ON" message is displayed then press SELECT. Press PROGRAM and the scanner will memorize the flame ON condition as described in the "Learn ON" section below. Press the DOWN key when complete.
3. Turn the target flame off. Press the DOWN key until the appropriate "START LEARN... OFF" message is displayed then press SELECT. Press PROGRAM and the scanner will memorize the flame OFF condition as described in the "Learn OFF" section below. Press the DOWN key when complete.

Note: *For proper operation, both a Learn Flame ON and a Learn Flame OFF procedure must be performed*

AIM SCANNER

Scroll to "SELECT to Enter AUTOMATIC CONFIG" and press the SELECT key.
When SELECT is depressed, "AIM SCANNER IR=xx UV=xx" is displayed. The value of "x" may range from 0 to 60. The value displayed represents the flame flicker intensity of the flame for *the entire flicker frequency spectrum* as individually sensed by the UV (U) sensor and/or IR (I) sensor(s).

The numbers should be at their peak (highest numerically) when the scanner is aimed at the primary combustion zone (first 1/3) of the flame. If the scanner is utilizing both the IR and UV sensors, priority should be given to maximizing the UV intensity.

Run the flame at low fire rate and observe the signal intensity.

Physically aim the scanner at the first 1/3 of the flame to maximize the intensity reading. (Allow the scanner reading to stabilize at least two seconds after each movement).

If the reading is 10 or less, the intensity is marginal and it may be necessary to increase the IR and/or UV Gain Range. Depress the DOWN key to view the current IR Gain Range and UV Gain Range settings. Increase the setting from LOW to MED or HIGH as required.

Note: *The scanner has selectable internal Gain "Ranges" for each IR and UV sensor. Scanners with Engineering Code 00 through 04 have two ranges for each sensor, "LOW" and "HIGH". Scanners with Engineering Code 05 and higher have three ranges for each sensor, "LOW", "MED" and "HIGH". Scanners with Engineering code 09 and higher have five ranges for IR, "LOW", "LOW+1", "LOW+2", "MED", and "HIGH".*

Note: *In rare applications where the flame is extremely bright, it is possible to saturate the sensor. The symptom could be a very low signal, an erratic signal, or no signal at all. In this situation, the installation of a sight-pipe orifice kit (P/N 53-121) is recommended.*

A-IR GAIN RANGE *(The "A" indicates the active file selected)*

If, when "Aiming" the scanner, a flashing "IR TOO HIGH" message is observed, then the signal is over-range and the "Range" should be reduced to either "MED", "LOW+2", "LOW+1", or "LOW". If, when "Aiming" the scanner, an IR number of less than 10 is observed, then the gain Range should be increased to either "MED" or "HIGH". **Refer to notes above.**

A-UV GAIN RANGE *(The "A" indicates the active file selected)*

If, when "Aiming" the scanner, a flashing "UV TOO HIGH" message is observed, then the signal is over-range and the "Range" should be reduced to either "MED or "LOW". If, when "Aiming" the scanner, a UV number of less than 10 is observed, then the gain Range should be increased to either "MED" or "HIGH". **Refer to notes above.**

START LEARN FR1 and FR2 ON

To begin LEARN Flame ON for Both FR1 & FR2, make sure flame is at LOW Fire position and press the PROGRAM key. A prompt will display “MAKE SURE FLAME AT LOW EMISSION, PRESS PROG KEY TO START LEARN.”. When the LEARN has completed, press any key to continue.

START LEARN FR1 and FR2 OFF

To begin LEARN Flame OFF for Both FR1 & FR2, make sure flame is OFF, then press PROGRAM key. A prompt will display “MAKE SURE FLAME IS OFF! THEN…PRESS PROG KEY TO START LEARN.”. When the LEARN has completed, press any key to continue.

START LEARN FR1 ON

To begin LEARN Flame ON for only FR1, make sure flame is at LOW Fire position and press PROGRAM key. A prompt will display “MAKE SURE FLAME AT LOW EMISSION, PRESS PROG KEY TO START LEARN.”. When the LEARN has completed, press any key to continue.

START LEARN FR1 OFF

To begin LEARN Flame OFF for only FR1, make sure flame is OFF and press PROGRAM key. A prompt will display “MAKE SURE FLAME IS OFF! THEN…PRESS PROG KEY TO START LEARN.”. When the LEARN has completed, press any key to continue.

START LEARN FR2 ON

To begin LEARN Flame ON for only FR2, make sure flame is at LOW Fire position and press PROGRAM key. A prompt will display “MAKE SURE FLAME AT LOW EMISSION, PRESS PROG KEY TO START LEARN.”. When the LEARN has completed, press any key to continue.

START LEARN FR2 OFF

To begin LEARN Flame OFF for only FR2, make sure flame is OFF and press PROGRAM key. A prompt will display “MAKE SURE FLAME IS OFF! THEN…PRESS PROG KEY TO START LEARN.”. When the LEARN has completed, press any key to continue.

SELECT to Exit BACK to CONFIG

Return to top of the Config Menu

SELECT to Exit BACK to MAIN

Return to top of the Main Status Menu

Application Notes:

1. The scanner stores the current real-time FEG value any time a Learn Flame ON procedure is performed.

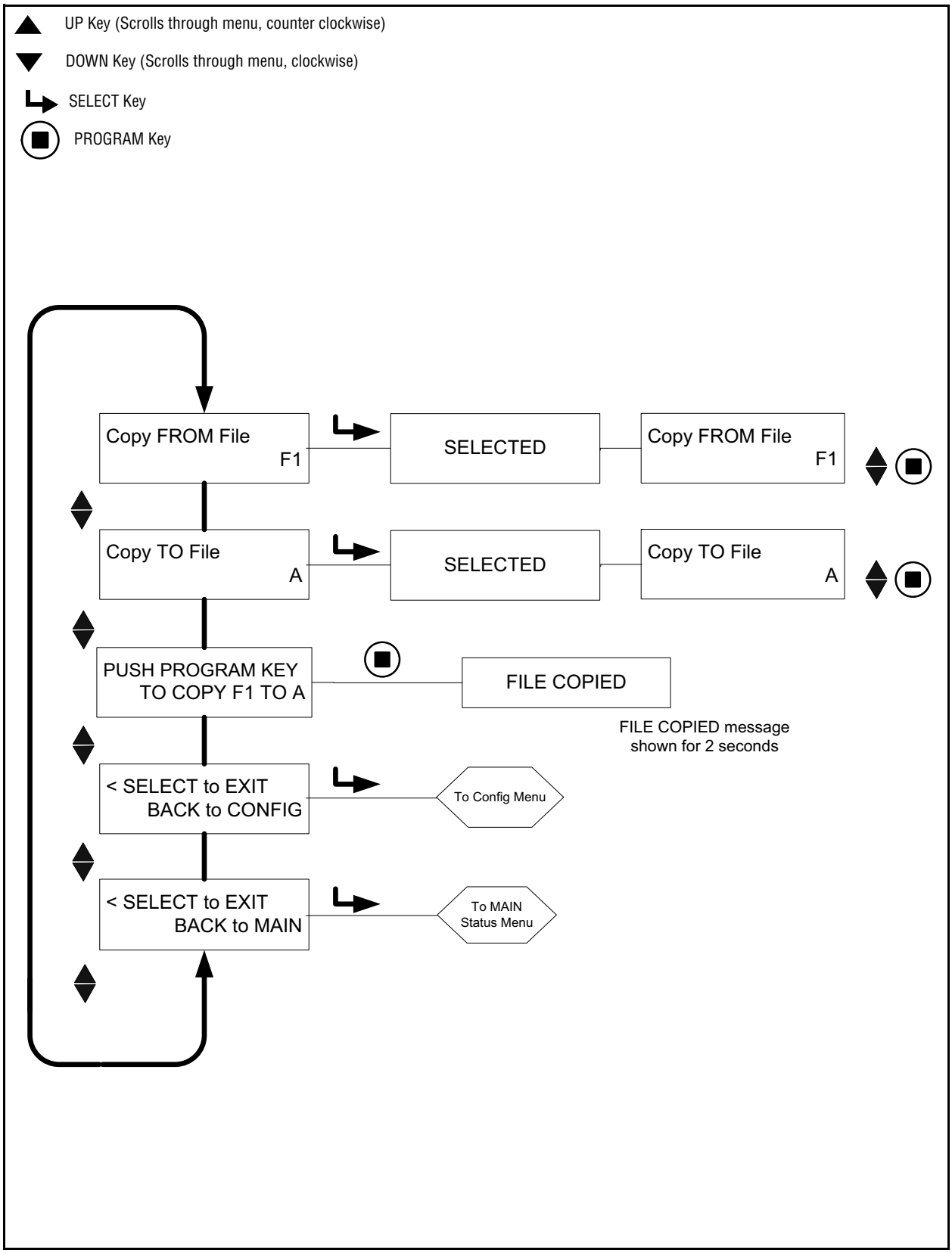
2. The scanner will automatically select the appropriate sensor, sensor gain, and bandpass frequency for optimum discrimination, only after **both** the Learn Flame ON and the Learn Flame OFF procedures are performed once.

3. The Learn Flame ON and Learn Fame OFF procedures may be performed in either order. However, for proper operation the Learn Off procedure must be performed with the same level of background radiation that would be present in typical use. For example, in a multi-burner application, the Learn Flame OFF procedure should be performed with the adjacent or opposed burners firing, not with a black boiler.

4. After a Learn Flame ON and a Learn Flame OFF procedure is initially performed, you may perform additional Learn ON or Learn OFF procedures if needed. Each time you perform **either** procedure, the scanner will automatically again select the appropriate sensor, sensor gain, and bandpass frequency for optimum discrimination.

THE FILE COPY MENU

FIGURE 28. FILE COPY MENU LOOP


UP Key (Scrolls through menu, counter clockwise)
DOWN Key (Scrolls through menu, clockwise)
SELECT Key
PROGRAM Key
Copy FROM File F1
SELECTED
Copy FROM File F1
Copy TO File A
SELECTED
Copy TO File A
PUSH PROGRAM KEY TO COPY F1 TO A
FILE COPIED
FILE COPIED message shown for 2 seconds
< SELECT to EXIT BACK to CONFIG
To Config Menu
< SELECT to EXIT BACK to MAIN
To MAIN Status Menu

THE FILE COPY MENU

Copy FROM File

The source file to Copy from. Valid files are 3 factory configured files (F1, F2, F3) and user configurable files (A, B, C, D).

Copy TO File

The destination file where the source is copied to. You may copy *from* any file *to* a user file. You are not allowed to copy *from* a user file to a *factory* file. Valid files are (A, B, C, D).

PUSH PROGRAM KEY TO COPY xx TO x

When the Source file and Destination file have been selected, press PROGRAM to complete the file copy action. The display will read File Copied when the copy is complete.

Note: *You are not allowed to copy to the file you are copying from. i.e. If you attempt to copy from A to A you'll get "Aborted Copy".*

SELECT to Exit BACK to CONFIG

Return to top of the Config Menu.

SELECT to Exit BACK to MAIN

Return to top of the Main Status Menu.

The file copy function allows the user to copy the contents of one internal scanner file to another.Models have four user configurable files, "A, B, C, D", plus three factory configured files, "F1, F2, F3".

You may copy *from* any file *to* a user file. You are not allowed to copy *from* a user file to a *factory* file. You must first enter the source file, then the destination file.

The **Factory Configured Files** ("F1, F2" and "F3") contain factory default settings.

In File "F1", the IR and UV User Gain values are set at 31. The IR and UV flicker frequencies (BAND) are set at 23 Hz. The IR and UV FEG LRNED settings are 255. At these settings the scanner will respond to flame but will not likely discriminate between the target flame and other nearby flames.

In File "F2", the IR and UV User Gain values are set at 15 and the IR and UV flicker frequencies (BAND) are set at 23 Hz. The IR and UV FEG LRNED settings are 255. At these intermediate settings the scanner may not respond to flame, and/or may not properly discriminate until the scanner is further tuned.

In File "F3", the IR and UV User Gain values are set at 1. The IR and UV flicker frequencies (BAND) are set at 179 Hz. The IR and UV FEG LRNED settings are 5. At these settings the scanner will not likely respond to flame until the scanner gain is increased.

Note: *As shipped, all user files (A, B, C, D) contain the same setpoints as factory file "F3".*

EXAMPLE:

With "SELECT to Enter File Copy Menu" displayed (CONFIG menu), depress the SELECT key. The display will read "Copy FROM File F1" with "F1" being the source file. Press SELECT and use the UP/DOWN keys to select a different source file if desired.(F1, F2, F3, A, B, C, D)

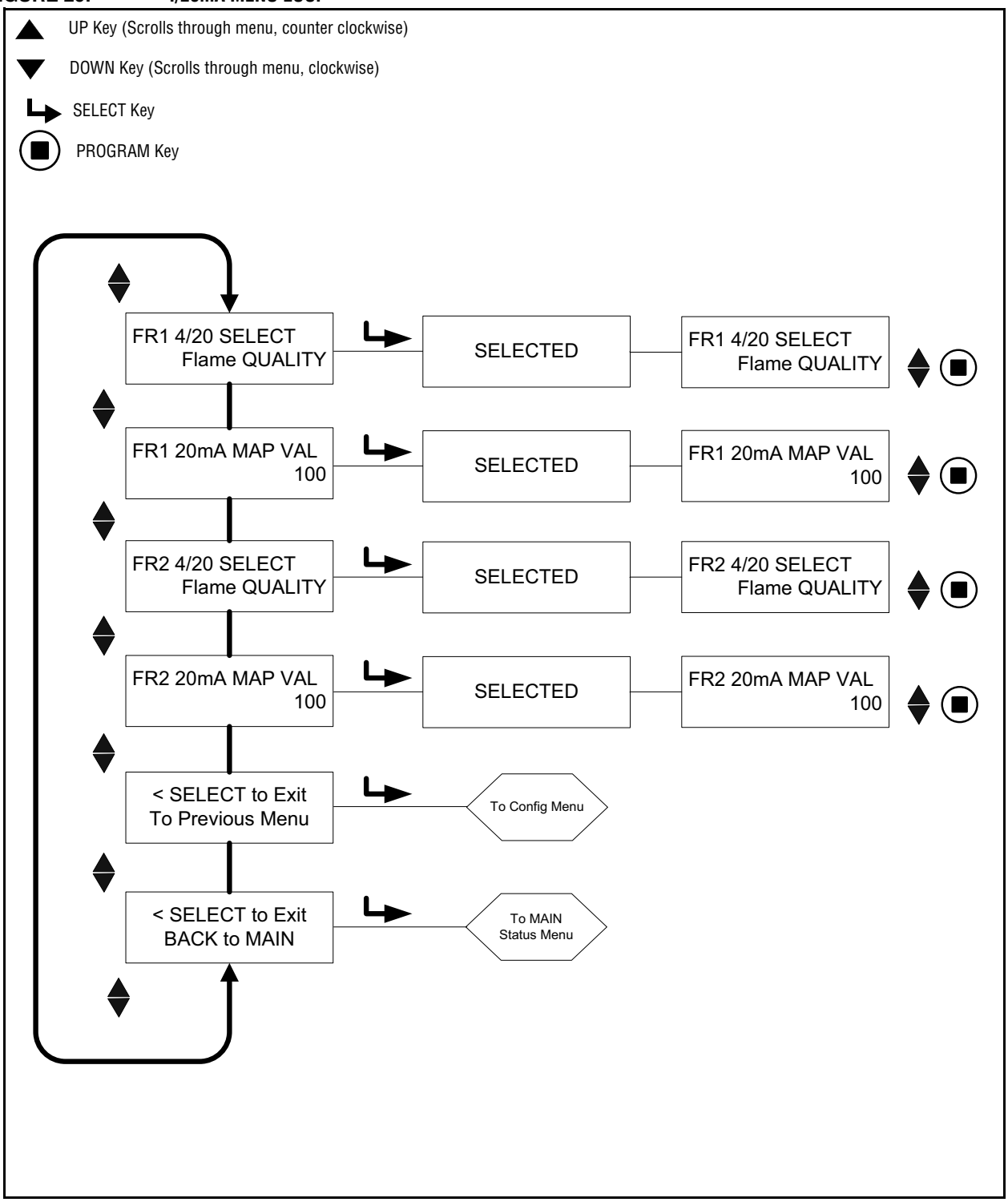
With the desired source file displayed, press the PROGRAM key. NEW VALUE SAVED will appear.

Press DOWN key to "Copy TO File" display and the destination file will appear (e.g. "Copy TO File A"). Press SELECT and use the UP/DOWN keys to select a different destination file if desired (A,B,C,D). Press PROGRAM to SAVE new destination value.

Press the DOWN key to display PUSH PROGRAM KEY TO COPY F1 TO A, then press PROGRAM key to copy the source file to the destination file. The display will read "FILE COPIED".

THE 4/20 mA MENU

FIGURE 29. 4/20mA MENU LOOP


UP Key (Scrolls through menu, counter clockwise)
DOWN Key (Scrolls through menu, clockwise)
SELECT Key
PROGRAM Key
FR1 4/20 SELECT Flame QUALITY
SELECTED
FR1 4/20 SELECT Flame QUALITY
FR1 20mA MAP VAL 100
SELECTED
FR1 20mA MAP VAL 100
FR2 4/20 SELECT Flame QUALITY
SELECTED
FR2 4/20 SELECT Flame QUALITY
FR2 20mA MAP VAL 100
SELECTED
FR2 20mA MAP VAL 100
< SELECT to Exit To Previous Menu
To Config Menu
< SELECT to Exit BACK to MAIN
To MAIN Status Menu

THE 4/20 mA MENU

FR1 4/20 SELECT

The user may select which parameter the 4-20 mA analog output represents for FR1. Choices are **Flame QUALITY** or **Flame SIGNAL**. Factory default is **Flame QUALITY**. Press SELECT to enter option; Use UP or DOWN key to pick Flame QUALITY or Flame SIGNAL; press PROGRAM to SAVE.

FR1 20mA MAP VAL (Range)

This option allows the user to select the 4-20 mA range (MAP VAL) of the parameter selected above.

If **Flame QUALITY** was selected, the analog output will be 4 mA when the FQ=0. The range, or Flame Quality value for 20 mA (20mA MAP VAL), is user selectable anywhere between 40 and 100. The factory default value is 100 (see Example 1 below). If the user selects a value of 50, when the Flame Quality reaches 50, the analog output will be 20 mA (see Example 2 below).

If **Flame SIGNAL** was selected, the analog output will be 4 mA when the flame signal is 000. The range, or Flame Signal value for 20 mA (20mA MAP VAL), is user selectable anywhere between 400 and 999. The factory default is 999. If the user selects a MAP VAL of 500, when the Flame Signal reaches 500, the analog output will be at 20 mA.

Press SELECT to enter option and then use UP or DOWN key to pick MAP Value (between 40-100 for FQ, or between 400-999 for FS), then press PROGRAM to SAVE.

FR2 4/20 SELECT

The user may select which parameter the 4-20 mA analog output represents for FR2. Choices are **Flame QUALITY** or **Flame SIGNAL**. The factory default is **Flame QUALITY**. Press SELECT to enter option; Use UP or DOWN key to pick Flame QUALITY or Flame SIGNAL; press PROGRAM to SAVE.

FR2 20mA MAP VAL (Range)

This option allows the user to select the 4-20 mA range (MAP VAL) of the parameter selected above.

If **Flame QUALITY** was selected, the analog output will be 4 mA when the FQ=0. The range, or Flame Quality value for 20 mA (20mA MAP VAL), is user selectable anywhere between 40 and 100. The factory default value is 100 (see Example 1 below). If the user selects a value of 50, when the Flame Quality reaches 50, the analog output will be 20 mA (see Example 2 below).

If **Flame SIGNAL** was selected, the analog output will be 4 mA when the flame signal is 000. The range, or Flame Signal value for 20 mA (20mA MAP VAL), is user selectable anywhere between 400 and 999. The factory default is 999. If the user selects a MAP VAL of 500, when the Flame Signal reaches 500, the analog output will be at 20 mA.

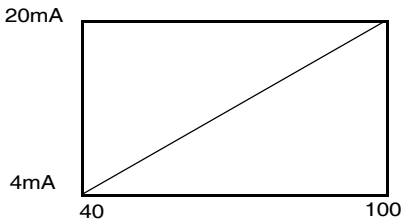
SELECT to Exit to Previous Menu

Return to top of the Config Menu

SELECT to Exit BACK to MAIN

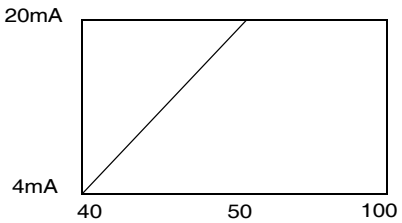
Return to top of the Main Status Menu

Example 1



Select = FQ
Map Value = 100

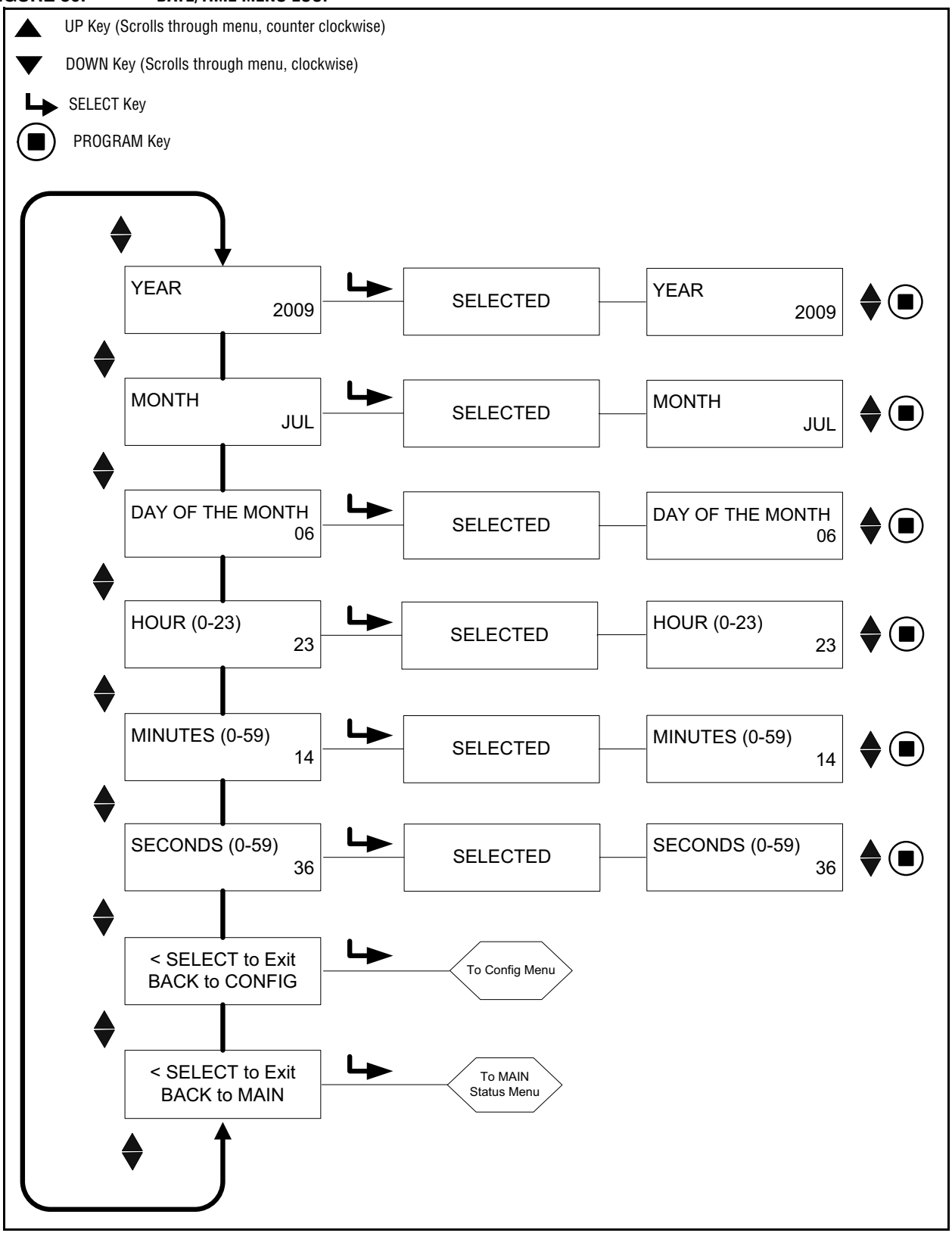
Example 2



Select = FQ
Map Value = 50

THE DATE/TIME MENU

FIGURE 30. DATE/TIME MENU LOOP



THE DATE/TIME MENU

The InSight II scanner has a real time clock for date/time stamping error information. The user must set the clock to the current date and time where the scanner is located. In the event the scanner is shut off for more than 36 hours, the date and time will have to be re-entered.

To set Date and Time while in the CONFIG mode, press the DOWN Key until SELECT to ENTER Date/Time Menu is displayed. and then Press SELECT.

YEAR

This option allows the user to set current YEAR. While YEAR 2xxx is displayed, press SELECT. Use UP or DOWN key to select current YEAR, then press PROGRAM key. NEW VALUE SAVED will appear.

MONTH

Press the DOWN key until MONTH is displayed. This option allows the user to set current MONTH. While MONTH is displayed, press SELECT. Use UP or DOWN key to select current MONTH, then press PROGRAM key. NEW VALUE SAVED will appear.

DAY OF THE MONTH

Press the DOWN key until DAY OF THE MONTH is displayed. This option allows the user to set current DAY. While DAY OF THE MONTH is displayed, press SELECT. Use UP or DOWN key to select current DAY, then press PROGRAM key. NEW VALUE SAVED will appear.

HOUR (0-23)

Press the DOWN key until HOUR (0-23) is displayed. This option allows the user to set current HOUR. The scanner uses a 24 hour time frame. While HOUR (0-23) is displayed, press SELECT. Use UP or DOWN key to select current HOUR, then press PROGRAM key. NEW VALUE SAVED will appear.

MINUTES (0-59)

Press the DOWN key until MINUTES (0-59) is displayed. This option allows the user to set current MINUTES. While MINUTES (0-59) is displayed, press SELECT. Use UP or DOWN key to select current MINUTES, then press PROGRAM key. NEW VALUE SAVED will appear.

SECONDS (0-59)

Press the DOWN key until SECONDS (0-59) is displayed. This option allows the user to set current SECONDS. While SECONDS (0-59) is displayed, press SELECT. Use UP or DOWN key to select current SECONDS, then press PROGRAM key. NEW VALUE SAVED will appear.

SELECT to Exit BACK to CONFIG

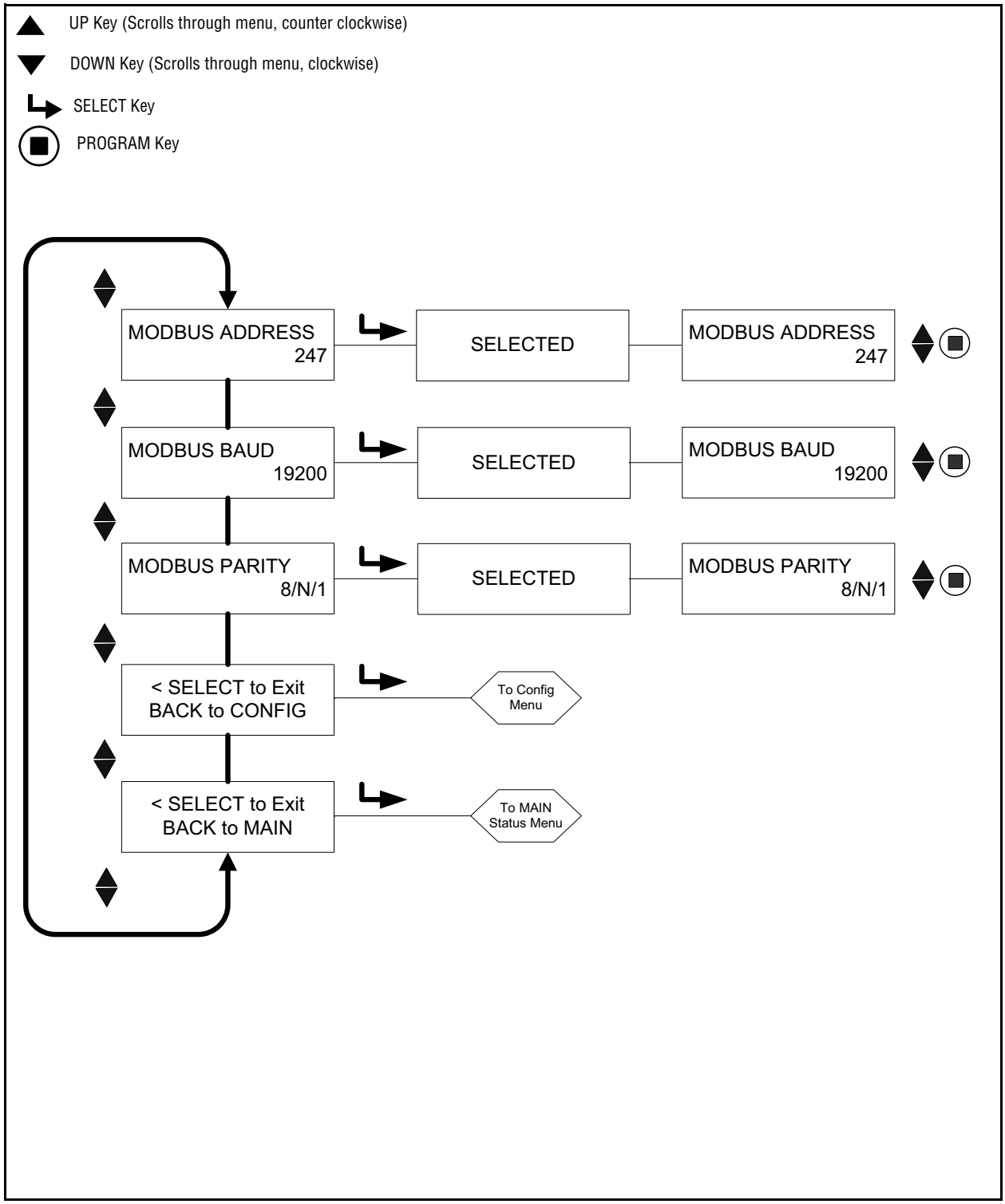
Return to top of the Config Menu

SELECT to Exit BACK to MAIN

Return to top of the Main Status Menu

THE COMMS MENU

FIGURE 31. COMMS MENU LOOP



THE COMMS MENU

MODBUS ADDRESS

This option allows the user to select the device modbus address. (Affects all files)

The communications address selected may range from 001 to 247. Each scanner must have a unique address. No two scanners in a communications loop can have the same address. Default factory address for InSight II is 247.

MODBUS BAUD

This option allows the user to set modbus communication baud rate. Valid values are 4800, 9600, 19200 and the factory default baud rate is 19200

MODBUS PARITY

This option allows the user to set communication parity. Valid values are 8/N/1, 8/E/1, 8/N/2, 8/O/1. Default factory parity is 8/N/1.

SELECT to Exit BACK to CONFIG

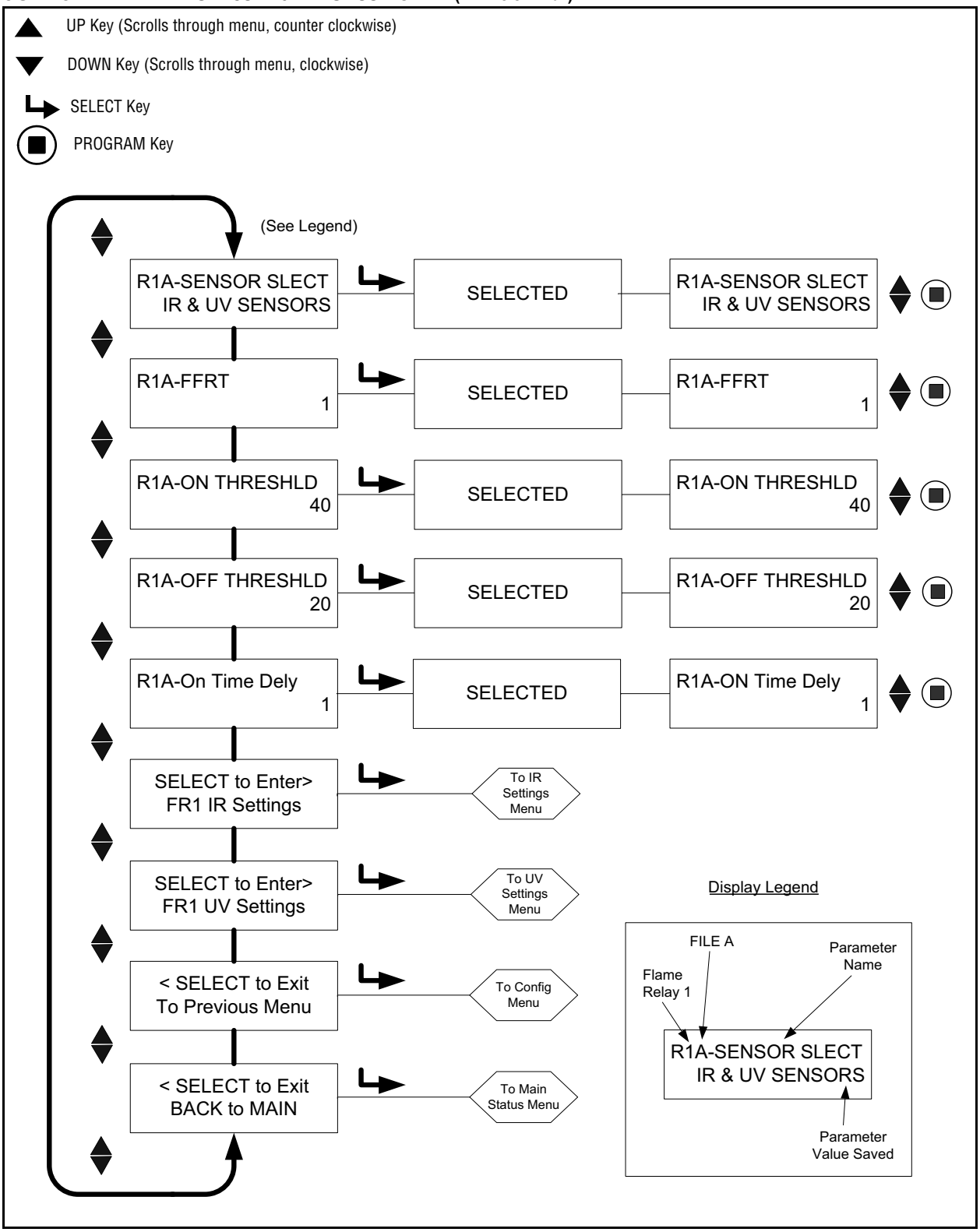
Return to top of the Config Menu

SELECT to Exit BACK to MAIN

Return to the top of the Main Status Menu

THE MANUAL CONFIG MENUS

FIGURE 32. MANUAL CONFIG MENU LOOP for FR1 (FR2 is similar)



THE MANUAL CONFIG MENUS

There are two MANUAL CONFIG menus, one for each flame relay, FR1 and FR2.

In each MANUAL CONFIG menu, the user may select the appropriate Flame-Failure-Response-Time (FFRT) for the flame relay as well as the on-time-delay setting. The user may also manually adjust the relay's Flame ON and Flame OFF thresholds, if desired.

Each MANUAL CONFIG menu contains two additional sub-menus, IR SETTINGS and UV SETTINGS, (described on the following pages). In the IR and UV SETTINGS menus, the user may manually adjust the sensor Flame Flicker Frequency (BAND), the sensor's USER GAIN, and the sensor's front-end-gain (FEG) settings, if desired.

Each heading begins with three characters, in this example “R1A”. The first two characters (R1 or R2) indicate which relay (FR1 or FR2) is selected. The third character (A,B,C, or D) indicates which memory file is selected.

The following descriptions refer to the MANUAL CONFIG FR1 menu.

R1A-SENSOR SLECT *(SELECT)*

This option allows the user to select the type of sensor to be used for R1 file selected (A, B, C, D). Choices include: IR & UV sensors, IR sensor only, UV sensor only. This parameter is used to manually select which sensor(s) are used in a particular file. Factory default is IR & UV sensors. The active file that this option will affect is identified in the third position (e.g. R1B is active file “B”).

R1A-FFRT

When the Flame Quality drops to or below the Flame Relay OFF Threshold, the relay will de-energize after the selected Flame Failure Response Time (FFRT). The choices are 1 to 6 seconds. The maximum *allowable* FFRT setting is determined by local safety code. The default is 1 second.

Any FFRT selection greater than 4 seconds violates the FM Class 7610 Approval and is therefore not FM Approved.

R1A-ON THRESHLD *(THRESHOLD)*

This refers to the “pull-in” threshold of the internal Flame Relay FR1, in terms of “Flame Quality”. The ON Threshold can be set from 5 to 100. The ON Threshold must be at least 5 units higher than the OFF Threshold. Factory default value is 40.

R1A-OFF THRESHLD *(THRESHOLD)*

This refers to the “drop-out” threshold of the internal Flame Relay FR1, in terms of “Flame Quality”. The OFF Threshold can be set from 0 to 95. The OFF Threshold must be at least 5 units lower than the ON Threshold. Factory default value is 20.

When the Flame Quality is equal to or less than the OFF Threshold (for a time equal to the “Flame Failure Response Time” setting, see below), the flame relay will de-energize.

R1A- On Time Dely *(DELAY)*

When the Flame Quality rises to or above the Flame Relay ON Threshold, the relay will energize after the selected On Time Delay (OTD). The choices are 1 to 6 seconds. The default is 1 second.

SELECT to Enter FR1 IR Settings

This option allows the user to select IR Band (Frequency default is 179Hz), User Gain (default is 1), FEG Learned (5), MIN FEG (5), and MAX FEG (255) values for the current active file.

SELECT to Enter FR1 UV Settings

This option allows the user to select UV Band (Frequency default is 179Hz), User Gain (default is 1), FEG Learned (5), MIN FEG (5), and MAX FEG (255) values for the current active file.

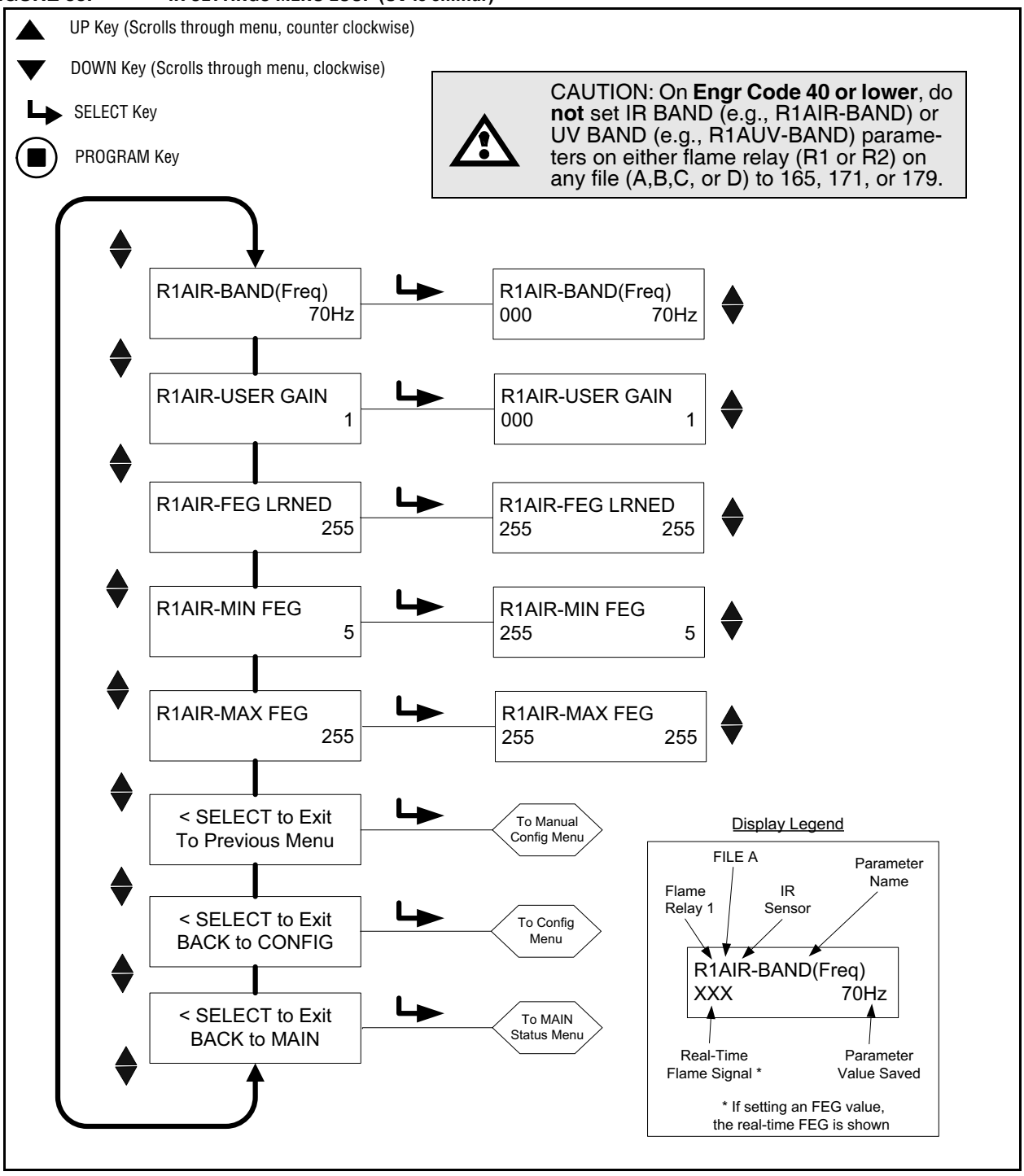
SELECT to Exit to Previous Menu

Return to top of the Config Menu.

SELECT to Exit BACK to MAIN
Returns to Main Status Menu

THE IR and UV SETTINGS MENUS

FIGURE 33. IR SETTINGS MENU LOOP (UV is similar)


UP Key (Scrolls through menu, counter clockwise)
DOWN Key (Scrolls through menu, clockwise)
SELECT Key
PROGRAM Key
CAUTION: On Engr Code 40 or lower, do not set IR BAND (e.g., R1AIR-BAND) or UV BAND (e.g., R1AUV-BAND) parameters on either flame relay (R1 or R2) on any file (A,B,C, or D) to 165, 171, or 179.
R1AIR-BAND(Freq) 70Hz
R1AIR-BAND(Freq) 000 70Hz
R1AIR-USER GAIN 1
R1AIR-USER GAIN 000 1
R1AIR-FEG LRNED 255
R1AIR-FEG LRNED 255 255
R1AIR-MIN FEG 5
R1AIR-MIN FEG 255 5
R1AIR-MAX FEG 255
R1AIR-MAX FEG 255 255
< SELECT to Exit To Previous Menu
To Manual Config Menu
< SELECT to Exit BACK to CONFIG
To Config Menu
< SELECT to Exit BACK to MAIN
To MAIN Status Menu
Display Legend
FILE A
Parameter Name
Flame Relay 1
IR Sensor
R1AIR-BAND(Freq) XXX 70Hz
Real-Time Flame Signal *
Parameter Value Saved
* If setting an FEG value, the real-time FEG is shown

THE IR AND UV SETTINGS MENUS

Each MANUAL CONFIG menu contains two sub-menus, IR SETTINGS and UV SETTINGS. In the IR and UV SETTINGS menus, the user may manually adjust the individual sensor values.

Each heading begins with five characters, for example “R1AIR”. The first two characters (R1 or R2) indicate which relay (FR1 or FR2) is selected. The third character (A,B,C, or D) indicates which file is selected. The last two characters (IR or UV) indicate which sensor's settings are being edited.

The following descriptions refer to the FR1 IR SETTINGS menu for file A.

R1AIR - BAND (Freq)

There are twenty-one choices of flame-flicker-frequencies (BANDS): 23, 31, 39, 46, 54, 62, 70, 78, 85, 93, 101, 109, 117, 125, 132, 140, 148, 156, 164, 171 and 179Hz.

R1AIR-USER GAIN

Adjust the sensor gain (1-31) so that the flame ON signal strength is well above the flame relay ON threshold, and the flame OFF signal strength is well below the flame relay OFF threshold.

Each upward step in the User Gain setting will increase the Signal Strength number for the selected sensor by approximately 50%. Each downward step in the User Gain setting will decrease the Signal Strength number for the selected sensor by approximately 33%.

Example 1: Assume that you observe an IR Signal Strength of "080" when the IR User Gain setting is 12. If you then increase the IR User Gain setting from 12 to 13 you should expect to see the IR Signal Strength increase to approximately "120".

Example 2: Assume that you observe an IR Signal Strength of "240" when the IR User Gain setting is 20. If you then decrease the IR User Gain setting from 20 to 19 you should expect to see the IR Signal Strength decrease to approximately "160".

R1AIR FEG LRNED *(LEARNED)*

The Front End Gain value stored when LEARN ON was performed. Possible values (5-255).

R1AIR MIN FEG

If the real-time Front End Gain value falls below this setting, the IR flame signal will be driven to zero. Possible values (5-255), default (5).

R1AIR MAX FEG

If the real-time Front End Gain rises above this setting, the IR flame signal will be driven to zero. Possible values (5-255), default (255). ***Note:*** *On the FEG settings screens, the current “real-time” FEG value is also shown on the left side of the display.*

SELECT to Exit to Previous Menu

Return to Manual Config FR1 or FR2 Sensor Select screen

SELECT to Exit BACK to CONFIG

Returns to Main CONFIG Menu

SELECT to Exit BACK to MAIN

Returns to Main Status Menu

MANUAL SET-UP IN MANUAL CONFIG FR1 & FR2 MENUS

In Manual Configuration, the user may set values for FR1 and FR2. Separate displays show the BAND (Freq), User Gain (1-31), FEG Learned, FEG Min and Max for the IR and UV sensor.

In the Manual Config Menu with the target flame ON (at low fire), record the sensor signal strength and stability at each of the 21 modulation BANDS: 23, 31, 39, 46, 54, 62, 70, 78, 85, 93, 101, 109, 117, 125, 132, 140, 148, 156, 164, 171 and 179Hz. The signal strength range is 0-999.

It may be necessary to adjust the sensor GAIN in order to keep the signal strength value on scale. If so, observe and record the sensor GAIN value (1-31) selected. Perform this step for each sensor.

In the Manual Config Menu with the target flame OFF (leaving other burners firing), observe and record the sensor signal strength and stability at each of the twenty-one modulation BANDS: 23, 31, 39, 46, 54, 62, 70, 78, 85, 93, 101, 109, 117, 125, 132, 140, 148, 156, 164, 171 and 179Hz *Do not adjust the sensor GAIN at this time.* Perform this step for each sensor.

At each of the twenty-one BAND settings, compare the recorded Flame ON signal strength to the recorded Flame OFF signal strength. Select the BAND setting that yielded the greatest Flame ON to Flame OFF signal ratio and the greatest stability. Perform this step for each sensor.

Adjust the sensor gain (1-31) so that the flame ON signal strength is well above the flame relay ON THRESHOLD, and the flame OFF signal strength is well below the flame relay OFF THRESHOLD (see "Flame Relay Thresholds").

When sensor select is "IR & UV", the flame relay and 4-20 mA output operate on the SUM of the IR and UV signals. When setting the GAIN adjustments, the user should favor the sensor (IR or UV) which exhibited the greatest flame ON:OFF signal ratio, and/or greatest stability. The user may choose to use the input from only one sensor by selecting "IR ONLY" or "UV ONLY".

Note: **For best scanner operation, the total Flame ON Signal Strength (IR Signal Strength + UV Signal Strength) should be between 100 and 150 or higher even though the Flame Quality display is capped at 100.**

Each upward step in the User Gain setting will increase the Signal Strength number for the selected sensor by approximately 50%. Each downward step in the User Gain setting will decrease the Signal Strength number for the selected sensor by approximately 33%.

Example: Assume that after selecting the best BAND settings for IR and UV, the flame signals are as shown in Table 1. Assume that the Flame Relay ON threshold is 40 and the OFF is 20:

Table 1

Target Burner Status	Flame Signal Strength (0-999)			Flame Quality (0-100) "FQ"	Flame Relay Status
	"IRFS (IR)	"UVFS" (UV)	"FS" (Combined)		
Burner ON	300	460	760	100	Energized
Burner OFF	40	10	50	50	Energized

In Table 1, the background flame signal (Target Burner OFF) is too high and is preventing the Flame Relay from de-energizing. The User Gains should be reduced to drop the Flame Quality number below the Flame Relay Flame OFF Threshold of 20.

Table 2 shows the results of lowering each User Gain setting by 4 steps (e.g. from User Gain=23 to User Gain=19):

Table 2

Target Burner Status	Flame Signal Strength (0-999)			Flame Quality (0-100) "FQ"	Flame Relay Status
	"IRFS (IR)	"UVFS" (UV)	"FS" (Combined)		
Burner ON	59	91	150	100	Energized
Burner OFF	8	2	10	10	De-energized

Flame Relay Thresholds

The flame relay has a factory programmed FLAME ON threshold of 40, and a FLAME OFF threshold of 20 (0-100 scale). With these settings, it is recommended that the flame ON signal normally be at least 150. Other on and off thresholds may be selected to suit particular applications.

CAUTION: After selecting Sensor TYPES used, Sensor BANDS, Sensor GAINS, and Flame Relay ON & OFF Thresholds, proper flame detection and flame discrimination must be verified by starting and stopping the burner several times. The flame relay must reliably de-energize for all flame out conditions. This testing should be done with various adjacent burners on and off, and at various load levels. This is a requirement for proper operation.

INSIGHT II FACTORY DEFAULT SETTINGS, USER FILES A,B,C,D and Factory File F3

PARAMETER	DEFAULT VALUE	ALLOWABLE VALUES
Config Menu:		
Remote File Sel	Key Pad	Key Pad, Line Inputs, Comms
PASSWORD	0205	0000-9999
FS Squelch Msgs	Do NOT Display	Display, Do NOT Display
IR GAIN RANGE	LOW	HIGH, MED[1], LOW+2[2], LOW+1[2], LOW
UV GAIN RANGE	LOW	HIGH, MED[1], LOW
		[1] ("MED" range available in engineering code 05 or higher) [2] ("LOW+2", "LOW+1" ranges available in EC 09 or higher)
4/20mA Config Menu:		
FR1 4/20 SELECT	Flame QUALITY	Flame QUALITY, Flame SIGNAL
FR1 4/20 MAP VAL	100	For Flame Quality: 40-100 For Flame SIGNAL: 400-999
FR2 4/20 SELECT	Flame QUALITY	Flame QUALITY, Flame SIGNAL
FR2 4/20 MAP VAL	100	For Flame Quality: 40-100 For Flame SIGNAL: 400-999
Date/Time Menu:		
YEAR	2010	2008-4095
MONTH	JAN	JAN,FEB,MAR,APR,MAY,JUN,JUL,AUG,SEP,OCT,NOV,DEC
DAY OF THE MONTH	01	01-31 (dependent on current value of MONTH)
HOUR (0-23)	00	00-23
MINUTES (0-59)	00	00-59
SECONDS (0-59)	00	00-59
COMMS SETTINGS Menu:		
MODBUS ADDRESS	247	001-247
MODBUS BAUD	19200	4800, 9600, 19200
MODBUS PARITY	8/N/1	8/N/1, 8/E/1, 8/N/2, 8/O/1
Man. Config FR1 Menu:		
R1- SENSOR SLECT	IR & UV SENSORS	IR & UV SENSORS, IR SENSOR ONLY, UV SENSOR ONLY
R1- FFRT	1	1,2,3,4, 5*, 6* *not FM class 7610 approved
R1- ON THRESHLD	40	5-100
R1- OFF THRESHLD	20	0-95
R1- On Time Dely	1	1,2,3,4,5,6
FR1 IR Settings Menu:		
R1 IR-BAND (Freq)	179Hz	23,31,39,46,54,62,70,78,85,93,101,109,117,125,132,140,148, 156,164,171,179Hz
R1 IR-USER GAIN	1	1-31
R1 IR-FEG LRNED	5	5-255

PARAMETER	DEFAULT VALUE	ALLOWABLE VALUES
R1 IR-MIN FEG	5	5-255
R1 IR-MAX FEG	255	5-255
FR1 UV Settings Menu:		
R1 UV-BAND (Freq)	179Hz	23,31,39,46,54,62,70,78,85,93,101,109,117,125,132,140,148, 156,164,171,179Hz
R1 UV-USER GAIN	1	1-31
R1 UV-FEG LRNED	5	5-255
R1 UV-MIN FEG	5	5-255
R1 UV-MAX FEG	255	5-255
Man. Config FR2 Menu:		
R2- SENSOR SLECT	IR & UV SENSORS	IR & UV SENSORS, IR SENSOR ONLY, UV SENSOR ONLY
R2- FFRT	1	1, 2, 3, 4, 5*, 6* *not FM class 7610 approved
R2- ON THRESHLD	40	5-100
R2- OFF THRESHLD	20	0-95
R2- On Time Dely	1	1,2,3,4,5,6
FR2 IR Settings Menu:		
R2 IR-BAND (Freq)	179Hz	23,31,39,46,54,62,70,78,85,93,101,109,117,125,132,140,148, 156,164,171,179Hz
R2 IR-USER GAIN	1	1-31
R2 IR-FEG LRNED	5	5-255
R2 IR-MIN FEG	5	5-255
R2 IR-MAX FEG	255	5-255
FR2 UV Settings Menu:		
R2UV-BAND (Freq)	179Hz	23,31,39,46,54,62,70,78,85,93,101,109,117,125,132,140,148, 156,164,171,179Hz
R2 UV-USER GAIN	1	1-31
R2 UV-FEG LRNED	5	5-255
R2 UV-MIN FEG	5	5-255
R2 UV-MAX FEG	255	5-255

Factory Files F1, F2, F3:

F1 (High Sensitivity): The IR and UV BAND settings are 23 Hz. The IR and UV USER GAIN settings are 31. The IR and UV FEG LRNED settings are 255. All other settings are the same as the File A,B,C, & D Factory Defaults.

F2 (Medium Sensitivity): The IR and UV BAND settings are 23 Hz. The IR and UV USER GAIN settings are 15. The IR and UV FEG LRNED settings are 255. All other settings are the same as the File A,B,C, & D Factory Defaults.

F3 (Low Sensitivity/Defaults): All settings are same as the File A,B,C, & D Factory Defaults.

INSIGHT II CONFIGURATION RECORD

Parameter	FILE A	FILE B	FILE C	FILE D
Config Menu:				
Remote File Sel				
PASSWORD				
FS Squelch Msgs				
IR GAIN RANGE				
UV GAIN RANGE				
4/20mA Config Menu:				
FR1 4/20 SELECT				
FR1 4/20 MAP VAL				
FR2 4/20 SELECT				
FR2 4/20 MAP VAL				
COMMS SETTINGS Menu:				
MODBUS ADDRESS				
MODBUS BAUD				
MODBUS PARITY				
Man. Config FR1 Menu:				
R1- SENSOR SLECT				
R1- FFRT				
R1- ON THRESHLD				
R1- OFF THRESHLD				
R1- On Time Dely				
FR1 IR Settings Menu:				
R1 IR-BAND (Freq)				
R1 IR-USER GAIN				
R1 IR-FEG LRNED				
R1 IR-MIN FEG				
R1 IR-MAX FEG				
FR1 UV Settings Menu:				
R1 UV-BAND (Freq)				
R1 UV-USER GAIN				
R1 UV-FEG LRNED				
R1 UV-MIN FEG				
R1 UV-MAX FEG				

- continued -

INSIGHT II CONFIGURATION RECORD (continued)

Parameter	FILE A	FILE B	FILE C	FILE D
Man. Config FR2 Menu:				
R2-SENSOR SLECT				
R2-FFRT				
R2-ON THRESHLD				
R2-OFF THRESHLD				
R2-On Time Dely				
FR2 IR Settings Menu:				
R2 IR-BAND (Freq)				
R2 IR-USER GAIN				
R2 IR-FEG LRNED				
R2 IR-MIN FEG				
R2 IR-MAX FEG				
FR2 UV Settings Menu:				
R2 UV-BAND (Freq)				
R2 UV-USER GAIN				
R2 UV-FEG LRNED				
R2 UV-MIN FEG				
R2 UV-MAX FEG				

INSIGHT II REPLACEMENT PROCEDURE

This procedure may be followed when replacing a damaged InSight II scanner. It assumes that the InSight II Configuration Record (above) was completed and kept as a reference when the original scanner was installed and calibrated. If not, the replacement scanner must be completely reprogrammed as describes earlier in this document.

1. Install the new scanner and apply power.
2. Enter the programming password and enter the CONFIG menu.
3. Manually enter the values from the InSight II Configuration Record into the new scanner.

Important Note: *After Step 3, the scanner should detect flame ON, but may not properly indicate flame OFF until Step 4 is performed.*

4. Create the burner firing conditions that existed when the scanner was originally installed and calibrated, typically the low-fire condition.
   a. Enter the AUTO CONFIG menu.
   b. Depress the Up button until “START LEARN ON” is displayed.
   c. Depress the Select button then the Program button.
   d. The scanner will set its internal Front End Gain Reference, count down from 16 to 0, then display “Learn Passed”.

Note: *If the proper data was manually entered into the EDIT menu, it should not be necessary to learn the flame OFF condition.*

5. Turn the burner OFF and ON to verify proper flame detection and discrimination.
6. Repeat Steps 2 through 5 for each scanner memory file used (A, B, C, D)
   or Copy “Upload/Download” saved parameters using Fireye Explorer software

ORDERING INFORMATION

Example:

To select the Fireye equipment meeting the following specification:

InSight II scanner, dual sensor, surface mounted NEMA 4X/IP66 enclosure with male electrical connectors. Accessories to include Keypad Display, 1" NPT Mounting Flange, 8 and 12-conductor cables with connectors, 3 meters long.

Order the following:

QUANTITY	PART NUMBER	DESCRIPTION
1	95DSS3-1	InSight II Scanner
1	95DISP-1	VFD Display with keypad
1	60-2919-1	1" NPT mounting flange
1	59-546-3	8 -Conductor Cable with connector, 3 meter
1	59-547-3	12-Conductor Cable with connector, 3 meter

NOTICE

When Fireye products are combined with equipment manufactured by others and/or integrated into systems designed or manufactured by others, the Fireye warranty, as stated it its General Terms and Conditions of Sale, pertains only to the Fireye products and not to any other equipment or to the combined system or its overall performance.

WARRANTIES

FIREYE guarantees for *one year from the date of installation or 18 months from date of manufacture* of its products to replace, or, at its option, to repair any product or part thereof (except lamps and photocells) which is found defective in material or workmanship or which otherwise fails to conform to the description of the product on the face of its sales order. **THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES AND FIREYE MAKES NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.** Except as specifically stated in these general terms and conditions of sale, remedies with respect to any product or part number manufactured or sold by Fireye shall be limited exclusively to the right to replacement or repair as above provided. In no event shall Fireye be liable for consequential or special damages of any nature that may arise in connection with such product or part

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